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MAY 28, 1951
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NEWS DIGEST

DOMESTIC

Carriage of 15,078 lb. cargo in S&W DC-4 over the westbound 2,437-mi. leg from Travis AFB, Calif., to Hickam Field, Hawaii, has been confirmed by MATS.

Shipment of 231 one to ten place personal executive planes was made by 11 companies during April, with total value of $1,592,000, makers' net billing price. There were 181 four-placers or more, 47 two-place and 3 one-placers. Shipments by ten companies in March totaled 270 valued at $2,159,000.

Exports of personal and executive planes of 6,000 lb. and less (empty airframe weight) during April by nine companies totaled 40 valued at $443,731, compared with 50 worth $703,430 the previous month.

Slick Airways completed first scheduled eastbound DC-6A flight from Los Angeles to New York, with plane carrying 30,000 lb. of air freight.

Convair XP5Y-1 resumed flight tests last week following installation of a new type turboprop control system designed to improve the plane's performance in the air and on the water.

Capt. James W. Jabara, Wichita, Kan., became the first U. S. jet ace on May 20, when he knocked down his fifth and sixth MiG-15 fighters over Sinuiju, Korea.

Air Materiel Command has awarded contracts for flight simulators to Curtiss-Wright, Link Aviation, North American Aviation and Engineering Research Corp. for the B-36, B-47, B-50, C-97, C-124 and F-86D. The simulators are understood to be similar in principal to the electronic Dehmel device.

Temco is reconditioning a considerable number of Republic F-47 Thunderbolts for USAF.

Northrop Aircraft has boosted pay of approximately 10,000 employes a total of more than $1,336,000 annually. The increases are retroactive to May 14.

FINANCIAL

American Airlines has declared a dividend of 25 cents per share on the carrier's $1 par value, common stock, payable June 20 to stockholders of record June 1.

Glenn L. Martin Co.'s backlog rose to over $400 million at the end of April, up sharply from the $195 million reported at the start of this year and the $287-million backlog at the end of February.

Sperry Corp. declared a quarterly dividend of 50 cents per share, payable June 18 to holders of record June 1.

Piasecki Helicopter Corp.'s net income for 1950 was up to $151,000, compared to $106,000 the previous year. Sales in 1950 advanced to $6,529,000, compared to last year's $5,022,000. At the year-end the company's backlog was over $6 million, it is now reported as approximately $100 million. Employment, now about 2,400 is expected to climb to over 4,000 by the end of 1951.

Aeroquip Corp. has a net income of $5,906,576 during the six months Oct. 1, 1950-Mar. 31, 1951, with profit after taxes being $408,738.

INTERNATIONAL

First 14 F-84 Thunderjet fighters have been turned over to the French Air Force. Most of the French pilots had received training at Las Vegas, Nev.

SO 1120 Ariel III, latest version of the jet-powered copter series, has made its first flight and is slated for large scale production. Ariel III is powered by Turbomeca Artouste turbine and has rotor tip combustion chambers where fuel is injected. It is all-metal, seats three and is expected to do 155 mph. Hovering ceiling is 5,905 ft.

Canada will spend $1 billion on aircraft engines and airframes over a three-year period according to Production Minister C. D. Howe. This is the largest single expenditure in the current three-year defense budget. At the same time, he said, $400 million is earmarked for electronics equipment a large part of which will go to the RCAF.

Avianca was to take official delivery of two Constellations on May 25. The first is scheduled to arrive in Colombia around June 10.

Britain's first four-jet bomber, the Vickers 660, powered by Rolls-Royce Avons, has made its initial flight. RAF is said to have ordered the new 600-mph plane "in quantity." Early reports give the Vickers 660 a span of 120 ft. and length of 68 ft. Ceiling is given as approximately 55,000 ft. A. V. Roe and Handley Page have similar projects in the works.

SIDELIGHTS

Air Force

USAF announces it has ordered into production a new single seat fighter-bomber version of the Lockheed F-94, the F-94D, similar to the F-94C interceptor. It uses the P&W 148, rated at 6,250-lb thrust without afterburner. This confirms AVIATION WEEK's May 7 story that such a plane had been proposed by Lockheed to the AF, to carry extra fuel tanks in the space occupied by the radar operator in the F-94C.

Purchasing officers from several nearby USAF bases will be stationed at the Western Air Procurement District, 155 W. Washington Blvd., Los Angeles. Local needs of the bases for supply & maintenance items are already posted daily in the Small Business Office in this building. Maj. Gen. Kenneth P. McNaughton becomes vice commander of Air Training Command June 1, replacing Maj. Gen. K. W. Burns. McNaughton was named Mar. 1 as special assistant to the deputy chief of staff, personnel, USAF GHQ, and has been monitoring all civilian school contract matters for the AF since then.

Publicity for Contracts

Munitions Board through Dept. of Defense announced that every negotiated procurement of $10,000 and over for Army, Navy and Air Force will be publicized in advance—where security permits—whenever the closing date for submission of bids or proposals is 18 days or more from date of issuance. Field and main procurement offices will transmit their proposals to the Dept. of Commerce for a weekly report. "The Munitions Board has advised the three military departments, and there has been included in the armed services procurement regulation, the firm policy that negotiated procurements, as well as formally advertised procurements, shall be broken down into reasonably small lots to permit making multiple awards," the Defense Dept. said.

Washington Notes

Aviation observers say Delos Rentzel, new Undersecretary of Commerce, is the best bet as a successor to the present Secretary of Commerce when President Truman accepts Mr. Sawyer's resignation, but they think much of Rentzel's influence in aviation would be diluted in the top Commerce job. . . CAB put up for bid the job of compiling and publishing its official Route & Mileage Manual, which was last issued in Sept. 1949. Low bidder was Air Traffic & Service Corp., headed by Max Tendler, which conducts economic research in air transportation and already publishes a daily Air Traffic Digest in Washington. . . Federal Trade Commission issued a complaint challenging representations that United States Navy Magazine is an official publication of the U. S. Navy Dept. and is owned, edited and published by Naval personnel. Respondents are United States Navy Weekly, Inc., Na-

(Continued on page 76)

Washington Roundup

150-Wing USAF: A Showdown

There will be a showdown in the Senate on the issue of a 150-wing USAF versus the 95-wing force supported by the Administration.

Sen. Henry Cabot Lodge will touch it off by trying to get funds tacked onto the military appropriation bill for fiscal 1952, to start the build-up to 150-wing strength.

The Administration's recommendation is $19.8 billion for USAF to build up to 95-wing strength by July, 1952—but the wings would be only partially equipped with first-line aircraft. The recommendation is now being gone over carefully by the House Armed Services Committee. The sentiment there is to cut out any fat that might be included in the $19.8 billion, rather than to raise the figures.

Under the 150-wing program, USAF would require $24.1 billion for a build-up to fully manned 95-wing strength during the 1952 fiscal year, $29 billion to grow to 120 wings during fiscal 1953, and $34.6 billion to reach the 150-wing strength during fiscal 1954. After that, the level-off cost would be $25 billion a year.

This program, which Lodge will fight for, would make AF the dominant U. S. service. Its $24.1 billion for 1952 would compare with Army's allocation, under the President's recommendation, of $20.8 billion, and Navy's, of $15.1 billion. Lodge had previously come out in favor of a 175-wing Air Force (AVIATION WEEK May 7), but since the timetables for both 150-wing and 175-wing strength would be the same through July, 1954, he is supporting the lower figure for the present.

Lodge's viewpoint: "We need 150 air groups, and as fast as we can get them. I certainly will offer an amendment to the 1952 military budget providing additional money to get started toward the goal." (Sen. Lodge presumably means wings. Congress hasn't caught up with the new USAF terminology. The term "group" is still in general use on Capitol Hill, although the "group" has given way to the "wing"—which includes additional supporting units—in USAF organization.)

JCS: Differing Outlooks

Joint Chiefs of Staff had divergent messages on the military outlook for the nation on its second Armed Forces Day.

- Gen. Hoyt Vandenberg: The big threat is Russia's all-out emphasis on long-range bombing. "Russia is building a powerful air force, but their greatest percentage increase is in the long-range bomber type. They have learned the importance of a long-range air force. This lesson, unfortunately, they learned from us." U. S. has the advantage in plane types. But Russia's advantage in numbers is increasing.
- Adm. Forrest Sherman: The U. S. "may have to fight a whole series of relatively small wars—unless we are willing to see the free world gradually grow smaller and less able to defend itself."
- Gen. Omar Bradley: "There's no easy escape from war by depending on sea and air power. . . Such a concept may provide some short-range security for the U. S. Its greatest fallacy is that it abandons our friends to be over-run on the ground."

It seems to add up this way:

Vandenberg would emphasize air strength to meet a Russian challenge in the air, Sherman would emphasize mobile sea power to "contain" Russia around the world, Bradley would emphasize land forces to hold off Russian occupation of Europe.

Congress-CAA Tiff

Outlook is that House Appropriations Committee will slash a big slice off the $205-million budget the President recommended for CAA for fiscal 1952.

The committee is pinching pennies on all non-military money. Added to this, committee investigators unearthed a series of cases of questionable use of funds by CAA—such as paying the travel expense of members of an official's family, using CAA cars to transport employes to work, spending money on airports and buildings that have never been used, except for social occasions. To cap the situation, ex-CAA Administrator Donald Nyrop and CAA's Director of Airports, Philipps Moore, irritated members of the committee by minimizing the importance of the investigators' cases. Particularly irritated Rep. John Rooney, chairman of the Commerce Department subcommittee, who two years ago slashed CAB funds following a personal fued with the then CAB Chairman, Joseph O'Connell.

"They tell me that the cases our investigators dug up are just isolated instances, but I'm not so sure that they don't reflect the general picture at CAA," Rooney commented.

Rooney's irritation with CAA might also mean a cutback in funds for CAB, which Nyrop now heads.

USAF, Army Public Relations

USAF and Army public relations expenditures are scheduled for a close going-over by the House Appropriations Committee soon.

A few weeks back the committee singled out Navy public relations expenditures for scrutiny. Naval men wondered at the special treatment for their service—particularly since USAF and Army have large PR staffs to represent them.

"It wasn't intentional, certainly," Rep. George Mahon, chairman of the Armed Services Appropriations subcommittee, says. "Before long, we'll take up the matter with the Army and Air Force, too.

"There's a definite need for public relations officers in the military services. They should give out information and correct misinformation. Too many of them, though, spend their time trying to get their chief's name in the papers."

Guided Missile Slowdown

USAF is moving slowly on development of its long-range guided missile testing ground based in the Banana River area in Florida.

Only $11 million has been invested so far.

In February, 1949, USAF urged Congress to authorize $200 million for a ground with a 3000-mi. range. At that time Research and Development Board's chairman Karl Compton said a 500-mi. missile would be ready for testing by the end of the year, that 5000-mi. missiles are "now within the range of possibility."

—Katherine Johnsen

INDUSTRY OBSERVER

▶ A Cessna 190, modified with leading edge panels of porous material through which air is drawn by a compressor and then ejected through outlets at the sides of the fuselage, is getting ready for boundary layer flight test investigations at NACA's Langley Laboratory. The plane has made some preliminary flights to establish its normal standard flight characteristics, but has not yet flown with the boundary layer apparatus installed.

▶ **Edwards AFB tests of the Turbolner, General Motors' Convair-Liner powered with Allison T-38 turboprops, are leading up to additional Air Force orders for Convair T-29 navigation trainers with T-38 turboprops instead of piston engines.**

▶ Piper Aircraft Corp. has two of its newly revised agricultural Super Cub planes flying on loan for the agricultural department of Ohio State University. The first ten of the production run for the new plane are in construction.

▶ **You can expect the eight-engine Hughes flying boat to resume its long-interrupted flight program soon. Modifications have been completed at Long Beach, Calif., and whenever Howard Hughes says the word the new series of water taxiing and flight tests can get underway.**

▶ NACA jet helicopter experiments indicate that when a jet-tipped rotor goes into auto rotation after power is cut or lost, it shows about 80 percent more drag, because of the ramjets at the tips, than does a rotor of the same blade section with plain tips. Blocking off the air intake of the ramjets after power is cut will reduce this drag nearly one-half.

▶ **Two new models of the slow-flying Helioplane—the four-place prototype civilian plane and a military liaison version—are now flying. The military version uses a bigger engine, a geared Lycoming 260-hp powerplant, but still keeps the very low 30 mph landing speed. While Helioplane Corp. still has its contract for future production with Aerouca, plans continue uncertain for production because of materials scarcities.**

▶ North American Aviation's experimental F-86 Sabre fitted with A. V. Roe Canada Ltd.'s 7,000-lb.-thrust Orenda turbojet is now at Avro's Malton, Ontario, plant for flight trials.

▶ **Tenth version of Project Skate, the Navy's long-continuing Convair development project for a jet-powered water-based supersonic fighter, is flying in model form with a 30-lb.-thrust jet powerplant.**

▶ Bendix Aviation Corp. has made a preliminary proposal to the Atomic Energy Commission for study of a reactor for the production of isotopes, to be built with private funds, AEC has disclosed.

▶ National Bureau of Standards has developed an automatic weather station with radio transmitter, which is designed to be parachuted from an airplane into otherwise inaccessible territory. It will automatically set itself in operation, make and transmit weather observations on temperature, pressure, and humidity. It is dropped from a bomb rack, and chute opens automatically, by pull of a static line. An electric clock then starts a series of operations, including firing of three explosive charges, one cuts loose the chute after landing; the second sets the station upright on a six-legged stand; the third raises a 20-ft. telescopic vertical antenna for transmission. At intervals the timer turns on the transmitter to send a pulsing signal, rate of which is determined by one of three resistors. These are connected to three measuring mechanisms which determine temperature, pressure and humidity. At the receiving station, the transmitter pulse rate is read as temperature, pressure or humidity, depending on a predetermined timing cycle. The device is a refinement of an earlier World War II automatic transmitter.

WHO'S WHERE

In the Front Office

Frank Watson, formerly with Solar Aircraft at San Diego, has been appointed vice president of Hiller Helicopters and will head the contracts administration division. During the last war he was contract director for Convair.

Lionel R. Fiedler, formerly sales manager of Arma Corp., Brooklyn, N. Y., electronic equipment maker, has been named vice president sales of the firm. Other new Arma vice presidents are **Walter G. McAllister**, former works manager, now vp manufacturing, Controller **William L. Hewitt** has been made vp controller.

Charles Froesch has been promoted to vp-engineering for Eastern Air Lines and **Joseph H. Brock** has been made vp industrial and personnel relations for the carrier. Froesch has been EAL chief engineer for 16 years and Brock was formerly director of industrial and personnel relations.

Henry T. Parrett, manager of the Washington, D. C., branch of Fram Corp., aviation and automotive filter maker, has been appointed a vice president of the firm. Parrett who has represented the company in Washington for ten years, set up Fram's Aviation division headed by **Charles L. Foley**, to take care of increased defense orders.

Walter H. Johnson, Jr., former vice president of American Airlines eastern region, has been named secretary of the carrier and assistant to the president. Former director of passenger sales **Theodore P. Gould** fills Johnson's previous post.

Changes

Harry S. Golden has been made production engineer in charge of all defense projects at Buick Motor division, General Motors Corp., and has named **Levi R. Grandy** superintendent in charge of testing the Wright J65 Sapphire turbojet which the division will build under license for the USAF. **E. H. Holzkemper** is Sapphire production engineer. **Joseph J. Schwemfurt** has been appointed assistant general superintendent in charge of J65 production.

John A. Van Hamersveld has joined Northrop Aircraft as supervisor of producibility engineering. **Dr. Charles E. Morgan, Jr.**, research physicist, has been named special assistant to the vice president engineering of Edo Corp. **W. D. Holman** is Hiller Helicopters' new chief of the materials division. **Harold W. Giesecke** has been appointed assistant to the general manager of Bendix Radio division.

Ralph A. Fuhrer is the new chief tool engineer at Convair's Ft. Worth division and **G. D. Higgins, Jr.**, has been made head of the division's new industrial security department. **D. C. Burrows** has been transferred from post as assistant division manager at Ft. Worth to San Diego where expanding programs require additional help. **Marion L. Hicks** is taking Burrows' former post.

AVIATION WEEK

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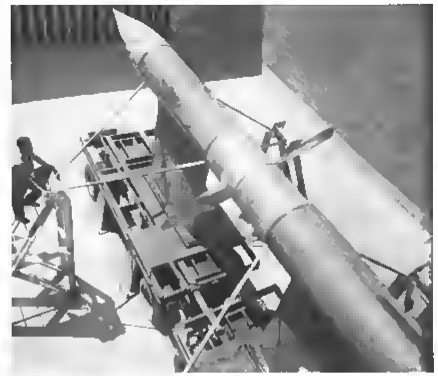
FOR COMPONENTS testing NACA uses this 16-ft. transonic tunnel. (return shown)



FOR PROPELLERS this 6,000 hp. dynamometer is placed in 16-ft. tunnel.

NACA Tunnels Bare Secrets of Transonic

New design of test sections for first time permits lab probing of Mach .8-1.3 zone.

By Alexander McSurely

Langley AFB, Va.—New secrets of the turbulent and unruly transonic region of aircraft speed are now being uncovered by U. S. aviation researchers as the successful culmination of a long-drawn out postwar research campaign.

Traditional tools of the aviation scientist—flight research aircraft and windtunnels—are gradually whittling away the mysteries of transonic speeds; but the tools have now been sharpened to a new keenness and are driven by greater powers for the job.

The difficult speed range between Mach Nos. 0.8 and 1.3 used to be considered the impregnable sonic barrier before Capt. Charles Yeager piloted the USAF's Bell X-1 rocket plane faster than the speed of sound on Oct. 14, 1947 (AVIATION WEEK Dec. 22, 1947).

Since the first Yeager supersonic flight, the transonic region has been crossed numerous times by various planes, but it still isn't easy.

► **Transonic Speed Data**—Until recently, all the aircraft designers in this country and elsewhere had to go on for transonic speed data was the experience they could get from flight tests. Some of it they compiled from flights by Yeager, Herbert Hoover and Howard Lilly of the National Advisory Committee for Aeronautics and other supersonic pilot pioneers. Additional facts about aircraft performance in the shadowy transonic region were radioed back from rocket-powered test models flown from NACA's Wallops Island, Va., testing base. (See accompanying story page 19.)

Last week at NACA's Langley Laboratory, it was disclosed that the researchers have licked the "choking" problem which heretofore had effectively bottlenecked transonic research with windtunnels.

All told, Langley Laboratory has 31 windtunnels ranging from a tiny 11-in. hypersonic windtunnel which is capable of simulating air speeds as high as Mach No. 17, up to the old-time full-scale windtunnel with a 60-ft. throat which is now used principally for landing speed tests, because its maximum speed is only about 200 mph.

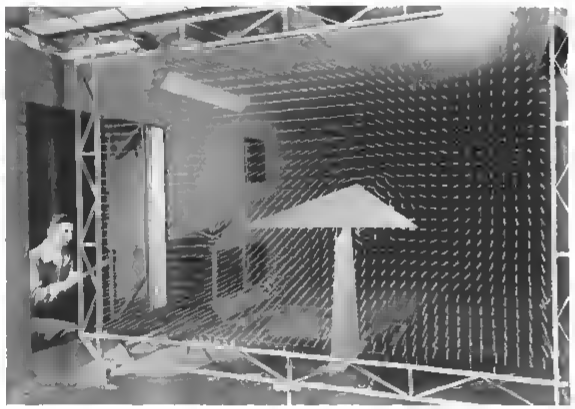
► **Two Tunnels**—The keenest interest being manifested at Langley is in two remodeled windtunnels, one with 8-ft. diameter test section, and one with 16-ft. section, both capable of providing accurate aerodynamic data throughout the transonic range. These are in addition to the smaller annular transonic windtunnel announced two years ago. This tested a small model whirled at high speed on the rim of a disk 5 ft. in diameter, but was not able to test larger models, and eliminate undesirable scale effects.

The choking effect in the throats of windtunnels at transonic speeds is caused by the piling up of shock waves across the test section due to the compression of mixed subsonic and supersonic air traveling at high speeds. Re-

The Atom: Power for Flight

Second of a Series *Page 23*

FOR MISSILES This little 1ft-in tunnel can churn up speeds of Mach 10, Mach 17 with chilled air.



FOR DELTA WING Studies wire grid with wool tufts shows turbulence behind each wing tip

designing the test sections to alleviate the choking has been object of long continued research

The 1,800 aviation industry personnel and government officials and aviation writers who last week saw the 16 ft transonic tunnel at Langley Laboratory found the test section boarded up with plywood to keep the exact method of relieving the shock wave pile-up a secret.

▶**"Ventilation"**—But John Stack, assistant research chief, disclosed that a method of "ventilating" the test section, had unchoked it. The test section was "ventilated" in many ways during the tests, he said, and this one "proved satisfactory."

Advantage of the large 16 ft transonic tunnel is that it can accommodate full-size airplane components such as propellers, engine nacelles, airfoils, tail surfaces and control surfaces, as well as large-scale aircraft models.

To drive the air through the test chamber at transonic speeds, two new 30 000 hp electric motors have been installed to turn new counter-rotating double fans, rated at 95 percent efficiency. They replace one 16,000 hp motor previously used.

▶**Model Tests**—One of the models installed for correlating tests in the 16 ft tunnel is a quarter-scale X-1 instrumented for as many as 200 pressure distribution readings simultaneously, from the wing leading. By testing the data from this model's tests against actual X-1 flight research test data it is expected that the aerodynamicists will develop much additional mathematical and theoretical information about transonic flow phenomena.

Another type of testing in the transonic 16-ft. tunnel involves use of a 6,000 hp propeller dynamometer, which makes possible testing of high-speed and supersonic propellers at large scale up to low supersonic speeds, thus obtaining for the first time accurate windtunnel data on aerodynamic and vibration characteristics of propellers at these speeds.

A 4 by 4 ft supersonic pressure tunnel at Langley Laboratory with an operating Mach range of 1.2 to 2.2 and variable density to permit attainment of large-scale results makes possible studies of supersonic plane and missile configurations relating to wing-body interference downwash, inlet characteristics, stability factors, and skin friction drag characteristics.

▶**Drag Reduction**—NACA researchers are seeking means to maintain a laminar flow of air around the contours of missiles and aircraft for high altitude and high speed flight conditions. They have already established that if this can be done, the skin friction drag can be reduced to about one-fourth of the drag now found with turbulent boundary layer airflow. This means that the overall drag would be reduced about one-half.

Aerodynamic heating of missiles at high supersonic speeds is another problem that will be greatly aided by achievement of successful laminar flow, eliminating skin friction, the principal cause for heating. If it proves feasible to combine advantages of laminar flow and the low atmospheric density found at high altitudes, the temperature limits of ordinary materials used in missiles will not be exceeded even on long flights at high Mach numbers, the NACA scientists report.

Other findings of aeronautical interest reported at the inspection:

• **Inlets**—Open nose inlets at higher supersonic speeds result in a strong detached shock wave developing at the nose, causing excessive loss of engine pressure and excessive drag. Problem of matching the size inlet to air required by engine at various supersonic speeds leads to solutions such as variable size inlets, probably using movable cones, or other means of varying the size of the opening. Use of side inlets with bypasses to remove sufficient quantity of boundary-layer air so that ram recovery losses can be reduced to a minimum may be the solution.

• **Pressure recording**—A 30-cell pressure distribution manometer for installation in wing of fighter planes, records data in tiny spots of light plotting a conventional pressure distribution diagram to be photographed by a motion picture camera. The new instrument gives a direct visual representation of the way wing loads vary in flight and determines regions of oscillating pressure.

Subcontractor's Market Guide

COMPANY	SUBCONTRACTING STATUS
Allison	Actively seeking subs now and will be
Bell	Same
Bendix	Same
Boeing	Same.
Chase	Not seeking now, but will be in 3 to 6 mo
Convair	Seeking only a few now, future plans depend on procurement schedules
Douglas	Adding 1 000 subs and suppliers this year
Fairchild	Not seeking now, may be in 6 mo
General Electric	Seeking small number for specialized items this will fill needs for next year or so
Grumman	In general, has lined up sufficient subs future depends on military schedule
Hamilton Standard	Actively seeking subs now and will be
Hiller	Same
Kaman	Actively seeking subs now and will be in 3 mo
Kollsman	Not seeking subs now, but will be in 6 mo to a year
Lockheed	Most contracts out only a few more to be let this year, but outside production to increase
Martin	Not seeking now and won't be for two years
McDonnell	Not seeking now but wants to build its list of prospects
North American	Not seeking now, future indefinite
Piasecki	Actively seeking subs now and will be
Pratt & Whitney	Same
Republic	Actively seeking subs now and will be, but principally interested in its WW II firms east of Chicago
Ryan	Actively seeking subs now and will be
Sikorsky	Same
Sperry Gyro	Always seeking new sources no intensive campaign now
Wright Aeronautical	Actively seeking now, and will be

Source: Aviation Week Survey

Poll Shows Rise in Subcontracts

Prime manufacturers report more than $500 million to be spent this year and rate nears wartime mark.

By William Kroger

Subcontractors are well on the way to getting the largest share of the military aviation procurement dollar.

In less than a year since the Korean crisis spurred rearmament, subcontracting is approaching—in some instances exceeds—levels reached only late in World War II—under mobilization for an all out war.

Ten prime manufacturers report they will spend a total of more than half a billion dollars with subcontractors this year—and that figure does not include some of prime manufacturers most active in seeking subcontracts.

Trend of subcontracting indicates it will become a permanent part of the aircraft industry's production process, constituting a slow revolution in the industry's way of doing business. It is only coincidental that subcontracting especially to small business, now is politically popular. The industry has found it to be economically sound as well.

Those conclusions plus the accompanying tables, are the foremost results of an Aviation Week survey of prime manufacturers of airframes, engines, propellers and equipment. Last week the Aircraft Industries Assn released the results of its own survey. The conclusions of the two surveys are the same, but Aviation Week's report will deal with individual companies, while AIA reports overall figures.

According to AIA's survey, 60 851 subcontractors are located in the District of Columbia and 41 states. New York has the most, 7,620, with Ohio and California next with 7,550 and 7 421, respectively. AIA says that nearly 50 percent of the dollar value of AF and Navy contracts goes to subcontractors and suppliers.

Subcontracting is swelling an aircraft industry once confined to a few plants in a few states. How fast subcontracting is expanding in the industry has been apparent for some months. Last Sept. 26, Aviation Week reported subcontracting policies of the major manufacturers plant by plant. A subsequent story Mar. 19, reported the reasons for the growth of subcontracting. This magazine has now completed its second survey on this subject and results will be disclosed in a series of reports of which this is the first.

▶**What Is Subcontracting?**—Those words and suppliers is why it is so difficult to give a complete picture of subcontracting today. It is a matter of definition. "Subcontracting" means one thing to one firm, something else to another. Some companies include all purchased parts in their subcontracting figures. Compounding the confusion is the term "outside production" which some firms use interchangeably with subcontracting and others use as distinct from subcontracting.

This conflict in terms perhaps can best be summarized by quoting B. C. Monesmith, manufacturing manager of Lockheed, a firm which makes a distinction between subcontracting and outside production.

"Subcontracting consists of the placement with an outside firm of the complete responsibility for the manufacture of a major component of the airframe. The component may be as large as a complete wing or as small as a windshield assembly. Subcontracting, for this purpose, does not include work by outside firms which is limited to fabrication operations or even minor assembly work, even though the work is to our own design. This Lockheed calls outside production."

▶**Why Subcontract?**—The growth of subcontracting by the aircraft industry is one of the most interesting and significant developments of the times, the Aviation Week survey discloses. There is no one reason for the growth and no order of importance in the several

Subcontracting—WW II and Today

COMPANY	% OF FINISHED WORK BY VALUE WORLD WAR II	TODAY
Allison	46 (6)	46 (9)
Boeing	40	42 (1)
Chase	(1)	20
Convair	35	38
Douglas	35 (2)	45 (3)
Fairchild	N. A.	17
Ham. Standard	75 (2)	40
Hiller	11	50
Kaman	11	N. A.
Kollsman	11 (2)	15
Lockheed	27	24
Martin	N. A.	N. A.
No. Amer.	N. A.	36 (3)
P. & W.	all	65
Republic	67 (7 12)	31
Ryan	55	43 (8 13)

(1) Not in business at that time
(2) Less than 5 percent
(3) Includes non-airframe parts used
N. A.—Not available
Source: Aviation Week Survey

Who Subcontracts—And How Much

COMPANY	% OF FINISHED WORK BY WEIGHT OR VOLUME	VALUE
Allison	66 66	66 66
Boeing		42 1
Chase	10	20
Convair		33
Douglas		40 5*
Fairchild	17	17
Ham Standard	75	40
Hiller	90	50
Kaman	80	
Kollsman		10
Lockheed	30	24
Martin	2	
No. Amer		30*
P & W	68	50
Republic	31	
Ryan		43 8*
A helicopter firm	70	80
An airframe firm		32 2

*Includes materials purchases.
Note: Companies surveyed, but which did not respond or cannot report percentages for reasons disclosed in the accompanying story were: Beech, Bell, Bendix, Chance Vought, Curtiss-Wright, General Electric, Grumman, McDonnell, Northrop, Pitasecki Sikorsky, Sperry, Westinghouse. All of them subcontract work.
Source: AVIATION WEEK Survey

Subcontracting—Distribution by States

(Figures refer to number of subcontracts)

N Y	7,020	Okla	27
Ohio	7,330	Colo	22
Calif.	7,421	Ga.	14
Ill.	5,802	Vt.	12
Pa.	6,239	Ky	11
Mich.	5,201	Ariz	10
N J	4,545	N C	10
Ind.	4,218	Fla.	8
Conn.	3,480	S D	7
Mass.	3,944	W Va	5
Md.	1,280	Ore.	5
Mo.	912	La	4
Tex.	872	Ark	3
Minn	743	Neb	3
Kan.	632	Ala	2
Wis	347	S. Car	2
Del	231	N M	1
Wash	198	Ida	0
R. I.	131	Mont	0
Me.	91	Nev	0
Wash., D. C.	69	N D	0
N. H.	52	Utah	0
Iowa	45	Wyo	0
Va.	42	Miss	0
Tenn.	39	TOTAL	60 661

Source: Aircraft Industries Assn.

reasons for it. One reason is equal to another; one feeds another.

Subcontracting probably is as old as the industry, if you take the broad view that every time a manufacturer has something made outside his plant he is subcontracting. But certainly Pratt & Whitney Aircraft division of United Aircraft Corp. is the pioneer in present-day subcontracting. Its manufacturing process from the start has been built around the subcontracting principle in order to keep the home plant small and yet have expansion potentials in emergencies (AVIATION WEEK Mar. 19, p. 13).

On the airframe side, Grumman probably is the pioneer, filling the small metal-working shops all over Long Island during peak production periods.

Because both these companies built up a strong subcontractor network years ago, and retained it after World War II, they are in a more fortunate position than most manufacturers. Their subcontracting needs now are chiefly for alternate sources of supply as insurance.

Both P&WA and Grumman have been high volume, low-cost producers that at the same time maintain a high rate of earnings. For years they have been the living proof that subcontracting is an economical way of manufacturing—a proposition that the balance of the industry has been slow to accept.

And though it is economically sound to subcontract, it is true that other factors have been just as strong in the trend.

• **Purely for defense purposes,** it is government policy to broaden the industrial base, get more companies equipped to participate in aircraft production and permit them to gain aircraft know-how.

• **It is government policy** to siphon more work to small business, which is hard hit by material shortages.

Prime contracts that small business can handle are limited, on the other hand, there is a great deal of aircraft work small firms can handle. So government has been pressing manufacturers to subcontract also as a means to aid small business. Aircraft manufacturers have become extremely sensitive to the capabilities and potential of small business—the subject of a future report in this series.

► **Who Subcontracts?**—The accompanying tables report the hard core of replies in the AVIATION WEEK survey. Practically all aircraft firms subcontract to some extent, but the survey covered only those believed to be subcontracting now in significant volume. That is the reason for the omission of the automotive manufacturers now taking on large airframe and engine contracts.

A few aircraft firms, notably Wright Aeronautical, are building up to such subcontracting programs that statistics now would be meaningless.

Another peculiar case is Bendix, with 14 divisions with varying degrees of autonomy. Overall records on subcontracting are not tabulated by the parent company. Several companies, for security or other considerations, did not wish to divulge statistics, while furnishing general information on their subcontracting programs.

What those programs are, how they are conducted, and how a subcontractor does business with specific plants will be reported next week.

One Man's Specs for USCG Flying Boat

A new flying boat able to lift 40 passengers from turbulent seas running up to 15 ft. high, and capable of setting down on the water without difficulty at night is the kind of plane the U.S. Coast Guard would like to have soon for its long-range overwater search and rescue missions, Capt. D. B. MacDiarmid of the Coast Guard station at San Diego, Calif., told members of the Society of Automotive Engineers during their recent meeting in New York City.

Rough water landings in the dark are "a terrifying experience for the pilot . . . and nearly every open sea landing is based on a calculated risk," the captain said.

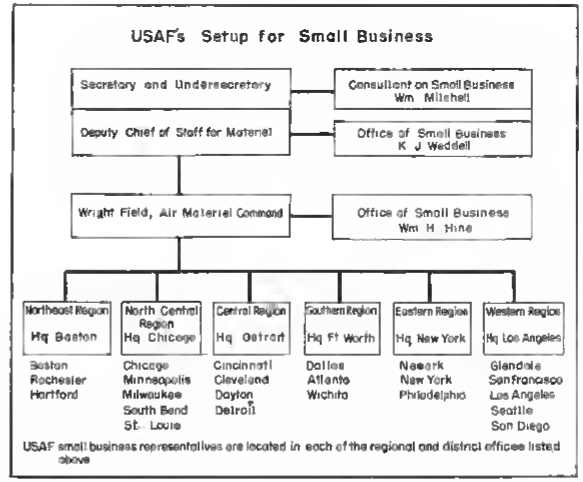
Special techniques have to be developed when new equipment is introduced, the captain noted, citing the reversible pitch prop. Here it has been found that during standing turns in high, steep, rough sea taxi tests, from up- to down-wind, the inboard prop buries its blades deep in the water. The resulting blade damage would be serious to a plane and its occupants if it happened hundreds of miles out in the ocean.

► **The Future**—Getting down to cases on the design of a new flying boat, here were some of the capabilities the captain sought. The plane should be able to cruise economically for 2,000 mi. at 180 kt. plus 2,000 mi. at 120-130 kt. For searching, the plane should be able to fly at 120 kt. at 500 ft., carry the best available radar, provide four efficient search stations in the bow and tail, port and starboard, and carry the best possible navigation and instrument aids for night flying.

The boat should be able to ride the sea safely on any heading, maneuvering freely regardless of wind and have means to bring passengers aboard from lifeboats or rafts even in rough seas. Adequate oxygen should be provided for 50 persons for six hours, and litter accommodations for 30.

► **Open Sea Operations**—Solution for operation on open seas proposed by the captain included: Improved lateral stability without substantial drag penalties perhaps by inflating boots about the wing tip floats, slow touchdown speed by incorporating variable aspect ratio, leading edge flaps, slots, quick deceleration, using water brakes, spoilers, retractable step, very good aileron control at low speeds, wing tip floats capable of riding in half-down—but braced—position while running on the step.

Citing the hard work the Coast Guard station at San Diego puts in, the captain told how during one 12-month period, all mercy missions averaged slightly over 1,000 mi. per mission.



USAF small business representatives are located in each of the regional and district offices listed above.

More Business for Small Business

USAF steps to give added work to small firms yield results: 50 percent of number of contracts.

Details of Air Force's "Operation Small Business" to broaden and strengthen its industrial base by fanning out defense work were unfolded to a joint session of the House and Senate Business Committees by USAF's Undersecretary John McCone.

He claimed "90 percent effectiveness" for USAF in utilizing small concerns, said the service is determined to achieve "100 percent effectiveness."

But McCone cautioned:

• **Small businesses are out** as far as USAF's major items of procurement go—airplanes, engines, propellers, fire-control systems, automatic pilots, superchargers. "No one would contend small plants could qualify as prime contractors."

• **Small concerns do not have** the facilities to meet advanced technical standards. For example, an electronic part being manufactured by Hughes Aircraft Co. requiring accuracy to within one-thousandth of an inch during the war, now requires accuracy to within a millionth of an inch.

► **Plenty of Room**—But despite the limiting factors, the field for participation of small concerns in USAF work is large—particularly in subcontracting. Production of one heavy bomber uses the facilities of 1,610 plants in 36 states; production of one aircraft engine requires supply, parts, materials and services of 4,604 plants in 34 states.

These are the steps McCone pointed out USAF has taken to develop the field:

• **Policy.** USAF official policy is to bring small plants "to the greatest possible extent" into the defense production program—both as prime and subcontractors. To implement this, each major prime contract includes a requirement that the contractor "agrees to accomplish the maximum amount of subcontracting to smaller plants . . . consistent with efficient performance . . ."

• **Organization.** Small business is now represented from top to grass roots in the USAF procurement organization.

An Office of Small Business directly under the Deputy Chief of Staff for Materiel has general supervision.

Wright Field's Office of Small Business screens all purchase requests to determine prime contracts suitable for small business. These are labeled. Specialists of the Office follow through, working with contracting officers to insure that the maximum number of them do go to small plants.

Small business specialists in USAF regional and district procurement offices follow through to achieve maximum subcontracting to small concerns.

• **Promotion.** Both on the regional level and the local level, USAF is active in promotional programs to acquaint small businessmen with USAF requirements and requirements of prime contractors in their areas to speed their work.

Regional exhibits of prime USAF contractors in New York, Chicago and Boston have brought thousands of small business representatives into contact with representatives of prime USAF contractors in their area and acquainted them with their requirements. Other exhibits are scheduled for Los Angeles, Seattle, Detroit, and Fort Worth. A spot check of the results of the New York exhibit developed that 145 small business plants had obtained or were negotiating contracts, 1,104 reported they had made important contacts, 1,095 said they had received no value from the exhibit—but 875 of these said they wanted to attend the next one.

• **Loans.** USAF aims to see that lack of working capital doesn't block small businesses from getting defense business. Seventy percent of the loans guaranteed so far under USAF's V-Loan program have gone to small concerns. This was only 10 percent, $17 million, of the dollar volume, though.

Optimistic over USAF's Operation Small Business, McCone reported small concerns are getting a large number of contracts—about 50 percent of the total. Although the small business dollar-volume cut in USAF business is small, it is increasing and is substantially greater than during the war.

During the first two months of the year, small business concerns obtained $30 million, or 70 percent, of the contracts for local purchases by USAF installations.

The $213 million in prime contracts awarded to small plants by Wright Field during the first quarter of this year was only 10 percent of the total dollar value of contracts let. But this compared with the 6.6 percent of the dollar value of Wright Field contracts let in the last quarter of '50 and the 4.5 percent for the three last years of the war.

Mobilization Office Fills Some Key Posts

Commerce Undersecretary Delos Rentzel and his Civil Air Mobilization Director, Donald H. Connolly, have been filling the gaps in their list of mobilization chiefs.

Here is the way the Civil Mobilization Office appeared to be shaping up last week:

• **Deputy Director** of Civil Air Mobilization Office—Charles O. Cary, executive secretary of the Air Coordinating Committee.

• **Transport Director**—George Gardner, president of Northeast Airlines.

• **General Operations Director**—William L. Anderson, Pennsylvania Aeronautics Commissioner.

• **Airports & Airways Director**—Charles Horne, CAA Administrator.

THERE'S BUSINESS for the small firm at the Boston show, but it may have to wait for it.

Clinic Charts New Business Path

First joint procurement show gives a pattern, but also points a lesson for exhibitors, subcontractors.

Boston—The first joint Armed Services Procurement Clinic has demonstrated once again the basic worth of a show getting together those with subcontracts to offer and those seeking subcontracts. At the same time, it showed several gaps procurement officials and participants will have to close if they hope to see subsequent shows fulfill expectations as a new way to help small business and broaden the production base.

Prime manufacturers and procurement officials planning future clinics undoubtedly are studying three aspects of the event just concluded here and the earlier ones held by the Air Force alone in New York and Chicago.

• **Prime beneficiary** is the prime contractor not the firm looking for subcontracts.

• **Contracts to small business** do not immediately flow in volume from such gatherings, and there have been well intentioned, but unfortunate tendencies to give the impression that they are of almost instant use to small business.

• **Advance preparation** by a prime contractor is the factor governing how much benefit he will derive.

The show here, which originally was planned by the Air Force alone and then opened to Navy and Army participation, was in several respects the best of the three so far held, according to those familiar with the others. It did not draw as many visitors as the one at Chicago but it was better prepared. It was both larger and better prepared than the one at New York. In sum, it indicated that Air Force officials and some prime contractors have studied and profited by the experiences at New York and Chicago.

With the mold cast at Boston, it is expected that future clinics will be joint ones. The Navy, at first the coolest of the three services to the idea, is represented as being well-pleased with the results of the meeting here.

▶ **Wright Started It**—The procurement clinic' concept, a radical phenomenon of defense business today, stems from a plan of Wright Aeronautical Corp. With no history of subcontracting it put together a small private exhibit for firms in the New York area to seek help in its expanding jet engine program. Brig. Gen. Arthur Thomas, chief of the Eastern Procurement District, picked up the idea and adapted it to all prime contractors in his area willing to participate. The New York show in February drew about 4,500 visitors to displays of 32 prime contractors.

The Air Materiel Command at Wright Field found the concept sound and approved other regional clinics. The second, held at Chicago early this month, in ten days drew about 10,000 small business men to study exhibits of 76 prime contractors. Here in Boston booths of 77 exhibitors—including government agencies—drew about 6,500 in four days.

Somewhere between its birth in New York and its latest performance in Boston, the clinic concept got a shift in emphasis. In New York it was frankly a show to enable prime contractors to line up subcontractors. Advance promotion for both the Chicago and Boston events primarily stressed the aid a small business man could get by attending. The original theme was still there, but was subordinated. And that has been the root of any criticism the clinic concept has stirred up.

Jumping to conclusions, many small business men thought they could leave the shows with signed orders in their pockets.

Subcontracts have been signed at the clinics; and others have resulted directly from contacts made there. To date, only the New York show has furnished tangible information—145 firms have or are negotiating contracts as a result of the exhibit. Here in Boston, a dozen or so contracts actually were completed, many more reportedly were completed.

▶ **Exhibitors Benefit**—But on the whole, the exhibitors got more immediate benefit for their efforts than those who looked at the exhibits. Chrysler and Studebaker—automotive firms just getting into aircraft engine production—are good cases in point. They won't be ready to subcontract for months. But they got lists of firms that may be able to help when the time comes. As a Studebaker representative said: "It would take us months and much traveling to round up a list that we have gotten in a few days here."

Some sponsors of the event, looking back on it, make two other points about the aid a small business can obtain from a gathering of this kind. One, the items exhibited must be in with the industry of the area; two, the business must be available.

New England which comprises most of the Northeastern Air Procurement District, is a complex of small metal working plants. It perhaps is, as the district commander, Col. William P. Farnsworth says, the last stronghold of the owner-manager business. The workmen are highly skilled, but their plants and tools are designed for small work.

Pratt & Whitney Aircraft has had signal success with New England machine shops and Wright Aeronautical claimed it gave 50 orders at the show. But Boeing, looking for plants to machine large forgings made by Wyman-Gordon, found no takers in New England. (However, the New York representative of a large company thought his Chicago factory could handle the job.)

So, many a New England small businessman departed muttering "nothing here for me." What he actually was complaining about, although he didn't know it, was that the defense program is not yet large enough to seep down to his level. This was shown in another fashion.

Among the New England businesses hardest hit by the material shortages is jewelry manufacturing. During the last war many of these firms had electronics subcontracts and that is what they want now. Numerically, electronic manufacturers possibly constituted the largest class of exhibitors. But their contracts have by no means reached the point where there are enough subcontracts to keep most small firms happy and busy. For one thing, too many electronic devices only now are moving from the development to the production stage.

▶ **Be Prepared**—It is in the realm of preparation for a show that procurement officials and prime contractors can do most to increase the effectiveness of the clinics. One example—Wright Aeronautical—furnishes a good case study.

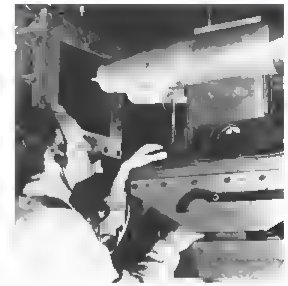
As part of its subcontracting program, Wright set up a Boston office months ago. Since then, personnel in that office have been carefully keeping a card file of data on firms in New England. The file cabinets were trundled into the Wright exhibit area (the largest on the floor) and when the visitors came, Wright's George J. Page and his co-workers knew who they were, what they could do and what they had come to see. Many had already discussed subcontracts in general terms with the Wright people. The exhibit where they could see what they were being asked to make, was the clincher.

Chrysler's preparation was just as thorough, but on a smaller scale and in a different vein as suited its needs. It merely had drawings and specifications and a long table with four chairs on each side. On one side sat the purchasing agents of the four Chrysler divisions represented. These were the men the small business man ordinarily would have to go to the Midwest to see. The Chrysler space came closest to the popular understanding of a clinic "patient" on one side of the table, "doctor" on the other.

Other exhibitors had layouts similar to Chrysler's. But some had lavish displays of products with stage lighting and working models.

Observers familiar with the New York and Chicago shows say the layout in the Commonwealth Armory here was an improvement. New York was the incubator and prototype; no one knew what the results would be and there was no experience record to read. Manufacturers exhibited their products on tables in a room in the offices of the procurement district headquarters.

In Chicago, the Air Force took over about 50,000 sq. ft. of the Navy Pier and as a critic put it, "the salesmen took over." The exhibits were eye-filling, but not a definitive as at the Boston show where the 52,000 sq. ft. of the armory was laid out for a business show.



RESEARCH PUNCH to missile work is given at Wallops Island by launching of craft such as delta model (left) and use of ramjet engines such as one on stand

Latest Missile Work Revealed

NACA show at Wallops Island gives glimpse of push button research on pilotless supersonic flight.

Wallops Island, Va.—National Advisory Committee for Aeronautics briefly hauled back the cloak of security surrounding this pilotless aircraft flight test base last week to give the nation's press a brief look and demonstration of activities at the $5 million installation.

Here, on a three-mile strip of deserted beach, 70 miles northwest of Langley AFB, NACA engineers are seeking answers to problems about aerodynamic design above the speed of sound. The base can be reached only by small boat, helicopter or water-based plane. No unauthorized aircraft may approach within 25 miles of the installation.

▶ **Model Tests**—NACA uses the facility as an operational test area for research plane and missile models designed and constructed at its Langley laboratory. The models are powered by rocket charges and are equipped with miniature electronic devices, radio telemeter and considerable instrumentation installed to complete various research data.

Research in matters of lift, drag, stability control effectiveness damping in roll, missile stabilization, flutter, buffeting, boundary layer phenomena, inlet performance, ramjet engine performance, and aerodynamic heating caused by skin friction at speeds from 1.5 to 4.0 or more are under continual study here.

Most test models do not resemble any specific aircraft, although complete model designs of such planes as the Douglas D-558 II, the Republic XF-91 and others have provided telemetered answers to the researchers during flight tests.

▶ **Expendable**—In most tests, however, a simple rocket fuselage platform equipped with wings, rudder or tail surfaces are flown for design performance study. These models cost from $500 to $15,000, have an in-flight life span of about a minute and one-half and meet destruction upon impact with the ocean. NACA says the models are expendable and no effort is made to recover them.

In many tests the research model is flown in the form of a two stage rocket. A booster rocket is used to give fast takeoff assist, driving the model up to about 750 mph. Just after the booster power is expended, a delayed fuse ignites a second rocket charge, and the model streaks away from the parent booster to attain a top velocity usually in the neighborhood of 1200 mph. Altitudes between 15,000 and 30,000 ft. are most common in these tests, although some models are flown as high as 100,000 ft.

So rapid is the completion of each test flight that it is difficult for the layman to comprehend the vast array of data obtained. Preparation for the flight is exacting to insure success of flight and accuracy of test. The actual firing and compilation of data for research is controlled and gathered by an electronic system.

About half a minute before actual firing of a rocket test vehicle, a chief engineer presses a button which starts up a series of relays and switches controlling the electronic equipment which records pre-firing, firing, and various phases of the flight. All of the recording and electronic equipment is housed in a bomb-proof concrete laboratory near the launching site.

▶ **Pre-Set Maneuvers**—In flight, the model under test may be put through any series of pre-determined and set maneuvers simulating a wide range of

flight conditions. During its 10-to-90-second flight, it can roll, climb, dive, and turn like an airplane—exerting forces on the wings and tail surfaces to give required data.

The model is tracked by radar and the information is radioed from the model by up to ten telemeter channels. The telemeter transmits a running record of acceleration, position of the controls, forces on the controls, aerodynamic forces acting on the model, attitude of the model in respect to air stream, and temperature.

For the tests two types of radar units are used—a Doppler velocity radar and a flight path radar. Their plots provide comparative data to check accuracy of the telemetered data from the model in flight.

NACA officials state that it is seldom necessary to fire more than one model of a specific design and that all test data needed from one model for a certain phase of research can be obtained in the few seconds of a research model flight.

The Wallops Island installation was established in 1945 at a time when data on transonic flow conditions was slight. Since the base was built, more than 1,500 models have been fired. The facility is operated by 75 engineers, technicians and mechanics under the direction of Robert L. Krieger, chief engineer.

Parks Moves From Hangars to Homes

Case history of a small airport which became more valuable as real estate for home development than it was as a landing facility for planes is being written at Norton Field, just outside Columbus, Ohio.

Norton Field, originally a National Guard airport, opened in World War I era, was acquired by Oliver Parks in 1946. The airpark and training school operator ran it until December, 1949. Then he converted the 127 acre field to a housing development.

Decision of Parks to convert is interesting in the light of his long experience in flight training and personal flying. At the peak of the postwar personal flying boom he operated a large Midwest chain of airparks for personal flying in half a dozen states, while Parks Air College at E. St. Louis, Ill., now a division of St. Louis University, is one of the best known training schools in the United States.

Parks is still a long range forecaster of big things for small airplanes in the future.

PICTURE CREDITS

13,14—NACA. 18—U. S. Army. 15—NACA. 34—Northrop. 35—NACA.

LETTERS

Dove Deal

Mr. Martin Sharp, of our patent company in England, has written to draw my attention to the following paragraph on page 41 of your Jan. 1 issue:

"Wiggins Airways. Feeder wants to buy the de Havilland Dove, and the deal is already worked out, but Wiggins cannot buy Doves unless CAB allows more mail pay. De Havilland has offered attractive pay-as-you-go terms, with only a relatively small down payment."

We do not feel that the Wiggins' case hinges on the payment of "more" mail pay by the CAB. As a matter of fact, Wiggins' application for mail pay to operate Doves is almost identically the same as their present mail pay for Cessnas—to be exact, 34.75 cents per mile for the Dove versus 34.71 for the Cessna. We do not feel that four one-hundredths of a cent per mile justifies the use of the term "more" at all.

Your statement would give the impression that the Dove must be an expensive airplane to operate because it requires more mail pay—and our thinking is just exactly in reverse.

We would appreciate it if you would check the above statements for verification with Mr. Joe Garside, President, Wiggins Airways, Boston, and if he confirms the mail pay figures we have used, we would like you to put your readers right on this point—as the impression created is that the Dove costs more to operate than other types.

A. F. MacDonald, Sales Manager
The de Havilland Aircraft of Canada, Ltd.
Postal Station L
Toronto

(Wiggins Airways has dropped its plans to buy two de Havilland Dove local service transports. Tacit disapproval by the Civil Aeronautics Board caused cancellation of the plans announced several months ago (Aviation Week Mar. 12, p. 51).)

Wiggins had planned to replace two of its present four passenger twin-engine Cessnas with the two ten passenger Doves and had prepared detailed cost estimates of service with the Doves and with two DC-3s, the other proposed replacement for the Cessnas. It was calculated that a Dove would operate over Wiggins New England routes at a cost of 8.133 cents per airplane revenue miles, vs. $1.03 for a DC-3.

Wiggins had asked CAB for retroactive mail pay of more than $100,000, stating that it would use part of the money as down payment on the Doves. CAB granted some $20,000 retroactive mail pay, and the carrier took this to mean that the Board disapproved of the proposed Dove purchase.

It is understood that the Board's turndown of Doves was based on the premise that if traffic over Wiggins routes (which has been very low) improved, the Doves would be too small to permit economic operations. On the other hand, mail rates granted Wiggins have been by no means large enough to underwrite either the purchase or operation of the bigger DC-3s.—Ed.)

Due Notice or Smear?

Thank you for your letter of Apr. 19 and for sending me an advance proof of your editorial "Due Notice or Smear?" which appeared in Aviation Week, Apr. 23. I am pleased at the invitation and opportunity to answer this editorial which characterized the Civil Aeronautics Board's order of investigation of Colonial Airlines as a "trial by press release."

No press release was issued by the Board in connection with its order of investigation of Colonial Airlines. However, under the law, the Board is required to make such orders public. In the Colonial case, the order of investigation was merely an announcement of an action and was not a Board decision. It was written as briefly as the legal requirements permitted.

I am puzzled at your criticizing the Board for not setting forth a full bill of particulars in the Colonial order of investigation. If we followed a practice of listing a bill of particulars in such orders, prior to subsequent public hearing, it would result in a one-sided and unfair trial of the case in the press and could prove harmful to the company or parties on which such orders are served. Indeed, to prevent such an undemocratic development, the Board prepares its orders of investigation as briefly as is legally possible, and I am confident that Colonial preferred this method in the subject case. When the public hearing opens before a Board Examiner in the U. S. Court House, Foley Square, New York, on Apr. 30, 1951 the Board's full bill of particulars will be set forth in detail for all to hear and Colonial will be present and then have its own opportunity to reply in full.

The Board's orders are required by law to be posted "in a public place" but the Colonial order was not posted in the Board's Public Information Office until the Board determined that the order had actually been served on Mr. Sigmund Janas, president of Colonial. Subsequently a copy of the order was then posted on the Bulletin Board but no press release was written nor was press distribution made of this order, although copies were and are available to the press or public on request as required by law.

Finally, your editorial stated that the Board's order of investigation has "smeared the airline with a stigma of guilt" only one day before Colonial announced completion of 21 years without a fatal accident. This is truly an outstanding air transportation safety record and one that the Board has publicly congratulated Colonial for achieving. However, the safety record of Colonial has nothing whatsoever to do with the Board order instituting an investigation of practices and conduct of Colonial and certain of its officers in connection with economic matters.

Edward E. Slattery, Jr., Chief
Public Information
Civil Aeronautics Board
Washington 25, D. C.

The Atom—Power for Flight

Nuclear Reactor: Its Design

In February of this year came the announcement that aircraft propulsion by nuclear energy theoretically was feasible. That statement presented the aircraft industry with a new world full of possibilities and problems.

Since February, AVIATION WEEK has been gathering material to acquaint you with this new source of power. The result is this series of articles.

Last week, the first installment of four reported current thinking about atomic structure and the binding energy holding atoms together. This energy is released by fission—a collision between a free neutron and an atomic nucleus. The binding energy reappears as kinetic energy of fission products; successive collisions convert the kinetic energy to heat.

This week's installment shows how the heat obtained by fission of Uranium 235 is converted into power.

By David A. Anderton

The general design specification for a nuclear—or any other—powerplant can be reduced to a single sentence.

▪ **The engine must produce, under safe and controllable conditions, a useful amount of energy which can be handled by normal machinery.**

That's the general spec, only in a detailed spec lie the differences—and the unique problems—of the nuclear engine.

▶ **Fuel and Fission**—The source of the energy output of any engine is locked within the fuel processed by the engine. In simple combustion, the energy output, only a fraction of the possible total, comes from chemical reactions involving only outer electrons of the atoms.

For the more sophisticated combustion process called fission, the energy is locked within the nucleus of the fuel atom, and that nucleus must undergo fission to release the energy.

So the first qualification of the fuel for a nuclear reactor is that it be able to undergo fission with some ease. A second consideration would be the availability of the fuel, tied in with this would be the purity of the fuel as it occurs in nature, the mining costs, processing costs and such. It would be best to have a fuel which occurs in nature in such usable form as to keep processing or refining costs to a minimum.

The only known natural material which fills these requirements is uranium. Contrary to popular impression, this metal is fairly abundant among the materials which make up the earth's crust. It occurs at the rate of about four cubic feet in a million.

However, the uranium in nature is in widely scattered deposits, and not very rich ones, either. Furthermore, natural uranium contains only 0.7 percent of the easily fissionable isotope, U235. The remainder of the uranium is U238, with a trace of U234.

So for the moment, let's assume that the fuel for the nuclear reactor is U235 as it is found in natural uranium.

▶ **Fission Reviewed**—The key to the energy storehouse in the nucleus is a neutron, the process which unlocks the door and releases the energy is called fission.

In fission, a neutron penetrates the nucleus of one atom of U235. Fission occurs, fission products are formed, and two or three or more neutrons are freed. The total mass of neutrons plus fission products is less than the original mass of the uranium atom, the difference has been transformed into energy.

This is in the form of kinetic energy of the fission products, blasted away from the nuclear explosion at the rate of 22 million mph. Collisions of fission products with other particles convert the kinetic energy into heat.

And this heat is the source of power which we finally get out of the nuclear reactor.

▶ **Neutron Supply**—In order to maintain this reaction, there must be a continuing supply of free neutrons. The available free neutrons in the system can have one of three fates. They can escape completely, be captured without fission, or be captured and cause fission.

The proportionality between the first two and the third defines the multiplication factor of the system.

In discussions of nuclear power production, the term capture cross-section will appear frequently. In a way, the cross-section is a measure of the probability of a collision between a neutron and an atomic nucleus. It is a measure of the number of hits experienced by particles bombarding a given target. If the cross-section is high, the probability of collision is also, and if it is low, there is little likelihood of a hit.

With this definition out of the way, we can go on to the general scheme of a nuclear reactor for power.

▶ **Roughly, This Way**—Most considerations of the nuclear reactor start by assuming the fuel (uranium) is distributed in lumps through a mass of material which has a low absorption of neutrons—a low cross section.

This binding material is called a moderator, and its purpose is to slow down neutrons to a speed which gives them about the same average kinetic energy as that carried by the atoms of the medium in which the neutron is banging around. Such slowed down neutrons are called thermal neutrons, fission of uranium by thermal, or slow, neutrons was the first and is the most important form of nuclear fission. U235, for example, is easily forced to fission by slow neutrons. And slow-neutron

fission is an easier process to place under control.

The moderator generally considered is graphite of high purity. The uranium fuel is placed in a lattice arrangement in lumps rather than in a finely divided dispersion. This is partly for convenience in handling (which will be considered later) and partly because it increases the overall efficiency of the reactor. In practice a slug of uranium results in less non-fission capture of neutrons than does the tiny-particle mixture.

The shape of the graphite-uranium lattice also has bearing on the number of neutrons which escape from the system or which are made available to further reaction. The number escaping is a function of the surface area of the reactor, the number captured is a function of the volume. Obviously, the way to keep captures high and escapes low is to have a maximum ratio of volume to surface area. The geometric solid with the highest volume/area ratio is a sphere.

▶**Bounce Them Back**—There is another step that can be taken to decrease the number of escapes from the reactor. This is to use a neutron reflector. A substance such as beryllium oxide acts like a mirror to neutrons, and bounces escapees back into the interior of the reactor.

The simplest method of controlling the reactor is to control the fate of neutrons, and so keep the multiplication factor of the system exactly at unity. Theoretically, this could be done by building the entire reactor exactly at critical size, this would be a task which would demand perfect calculation of the properties of every piece of material that comprises the reactor, and complete knowledge of the chemical composition of the pieces, and other impossible data. So rather than attempt the impossible, extra control materials are used in conjunction with a pile of near-critical size.

Some material with a high capture cross-section for neutrons is used for the control rods. These would be inserted into the reactor, and by being withdrawn or inserted, would control the absorption rate of neutrons by the control rod material and thus change the level of neutron production of the reactor.

▶**Schematic Reactor**—These are the steps in first considerations of a typical reactor, based only on the problem of making a controllable amount of heat energy available.

Summing up these steps, the rudimentary reactor is a sphere of lumps of uranium in graphite. Surrounding the sphere is a neutron reflector. Projecting through the reflector and into the sphere are neutron absorbers.

Energy released is in the form of kinetic energy of the fission products. This energy is dissipated by collisions, and the temperature of the reactor rises. The heat is the useful output of the powerplant.

But by itself, this heat is of no more value than a large bonfire would be. If it could be used to boil water or to heat a gas, either the steam or the hot gas could be run through a turbine, for example, to produce power. This could be done in a reactor by allowing water to flow through the lattice, picking up heat as it went, and at some point flashing into steam.

Unfortunately, it isn't that simple. The water would pick up heat all right, but it would also pick up the radioactive fission products and become contaminated. Such a powerplant, because of radiation dangers, could never be run by human engineers—at least not for long.

▶**Safe Power**—So for safety, the first consideration in the utilization of the heat output of a nuclear reactor is to be able to transfer the heat to some medium without the presence of radioactivity. This means an intermediate heat transfer fluid. And it would have to be sealed in a circulating system, closing in the reactor and one side of a heat exchanger. The heat would be transferred through the heat exchanger and into a working fluid. The vapor state of the working fluid furnishes thermal energy for running a conventional turbine.

And of course, the entire reactor is shielded to protect personnel.

That's the complete—if very rudimentary—story of the nuclear power plant.

All that remains is to have the engineers fill in the details.

And that is not simple. It is the study of just these details that has taken so much of the money and time that has been spent on nuclear energy during the past decade.

▶**Materials**—First among the detailed problems is the selection of materials for reactor and components of the system. This presents three major problems.

• **Temperature**. In order to get high overall efficiencies of any heat engine, the final temperature of the working medium coming out of the engine must also be high. This has been emphasized in the jet engine field by the quest for new, high temperature materials, but in atomic power fields the materials search has hardly been started.

• **Structural disruption**. It is entirely possible that the bombardment of materials by high-energy particles, such as neutrons, might displace atoms permanently from their crystalline lattice. Displacement of atoms can cause serious changes in mechanical properties of materials. As one example, the elec-

trical resistance, elasticity and heat conductivity of graphite all change when exposed to neutron radiation To check on these problems, a special materials testing reactor has been designed by the Oak Ridge and Argonne National Laboratories

• **Neutron absorption.** Any material used to construct the reactor must of necessity have a low capture cross section for neutrons

None of the usual engineering materials meets all of these requirements Aluminum, basic aircraft metal, has been used in some reactors, but only where temperatures can be kept at a low level Ceramics have also been investigated

▶ **Working Medium**—The heat transfer fluid selected for the engine must withstand high temperatures and neutron bombardment, and have a low capture cross-section for neutrons These are, of course, in addition to the ability to transfer heat efficiently and the required possession of a high boiling point

It's hard to say that any one of these properties is more important as a design criterion than any other But surely one of the most important is the extent to which the fluid captures neutrons If it does, it can become radioactive by the action of the neutrons, this could mean that units of the power-generating equipment could also become radioactive, and there would be danger to operating personnel

Suggested working fluids have included water under pressure, helium gas (which has almost zero capture cross-section), molten lead and molten cadmium. Mercury, which has been used for power production in mercury boilers and vapor turbines, has too high a capture cross-section Molten sodium, used in aircraft engine valves as a coolant, is not too desirable from the standpoint of handling characteristics And organic liquids decompose at high temperatures, to say nothing of what could happen to them under neutron bombardment

▶ **Ash Hauling**—One of the structural problems which will involve some gadgetry worthy of Rube Goldberg will be the stoking and ash-hauling gear

The ashes (fission products) are neutron absorbers If not removed, they can put out the atomic fire by absorbing enough neutrons to stop the chain reaction

These ashes are further mixed with the remaining uranium This lump has to be replaced as the available amount of U235 decreases

The ash-fuel mixture must be removed from the reactor and treated to separate out the uranium for re use as fuel But the high level of radioactivity of the mixture means that the mechanism for removal, all handling, and the separation plant must be entirely auto-

matic or must be remotely controlled

There would apparently be advantages in having stoking and hauling a continuous process, but for the moment, the procedure is to can the uranium fuel in aluminum. This package then can be handled with some facility

▶**Shielding Problems**—The fission process is accompanied always by emission of a variety of radiations and particles which are, in differing intensities, generally fatal to men. The radiation—which is a term not exactly correct, but generally applied to radiation and particles alike—is made up of alpha and beta particles, gamma rays and neutrons

The most easily stopped are alpha and beta particles. Thin layers of aluminum and plastics (Lucite or glass) can be used as shielding materials

Neutrons and gamma rays are something else. As has been mentioned, the fission process releases neutrons, and gamma rays come from the fission products

Neutrons are best absorbed by first decreasing their speed. The best materials for slowing down neutrons are elements of low mass number—hydrogen, for instance. But water—which is the most common material containing hydrogen—has disadvantages as a shielding liquid

In the search for other shielding media, concrete has been widely accepted. This is because it contains large amounts of water, either free or combined, and because it is readily available and easy to install.

▶**Concrete Insufficient**—But concrete alone is not sufficient. Gamma rays are produced when slow neutrons are captured by the hydrogen in the concrete; so it would seem as if the shielding defeats its own purpose to some extent. But iron has been found suitable to shield against gamma rays, and so the concrete shield is generally made of a special cement which contains magnetite or limonite (iron) ore. Thus, the concrete shield protects against both gamma ray and neutron penetration.

Shielding cannot stop at the reactor alone. The heat-transfer medium becomes radioactive by contamination from the reactor, and in turn can cause radioactivity in the materials of the heat exchanger, for example. So it would seem that shielding must also cover the first cycle of the heat transfer process

▶**Control Problems**—The fundamental approach to control of a nuclear reactor has already been described. But absorbing neutrons at a desired rate is not exactly easy

Generally it is assumed that rods of a material—cadmium is one example—are slid in and out of recesses in the reactor sphere, this insertion and withdrawal controls the rate of neutron release.

These rods are designed so that they penetrate about halfway into the pile when the reactor is working at a multiplication factor of one. To open the throttle, the rods are moved out, the amount of neutrons increases and the power level increases. To close the throttle, the reverse procedure is used.

But such a control system is not necessarily stable. Control rods are not analagous to throttles, because they control only the rate of change of power, and not the power level itself. In order to maintain the multiplication factor at exactly one, the control would have to be balanced with a precision not practical. In practice, the power of the reactor would be always decreasing or increasing.

Fortunately, there is a time lag built into the system. Some neutrons are delayed in the fission process—that is, they are liberated at some finite time after fission has taken place—and therefore are not instantly available to increase power. It is this time delay which makes control, albeit a hunting system of control, possible.

▶**Other Fuels**—At the beginning of this section, it was assumed that the fuel for the reactor would be natural uranium, containing 0.7 percent of fissionable U235. This choice was made because uranium does occur in nature and its U235 content is easily fissionable.

Natural uranium can be enriched by processing to remove the U238, this is expensive, but may prove desirable where fuel cost is not required to be competitive. The advantage is one of lessened fuel handling.

As a matter of incidental interest, there is a modified fission process which takes place in the chain reaction of uranium. Some slow neutrons will penetrate the U238 and form a new isotope, U239. This substance is radioactive and, by giving off a beta particle, becomes neptunium (Np239). This in turn undergoes transmutation by emitting another beta particle and becomes plutonium (Pu239). The plutonium thus formed is fissionable (by either slow or fast neutrons), and can be used as another atome fuel.

Theoretical and laboratory studies have shown that there is a chance of producing another fissionable material by the transformation of thorium (Th-232) with steps similar to those in the U238 to Pu239 process.

It appears that the designer of a nuclear reactor could choose his fuel from among U235, U238, Pu239 and Th232.

▶**Reactor Choice**—Another basic design choice faces the nuclear engineer. Reactors can be made to work using fast, intermediate or slow neutrons. They can be made to work at low, medium

or high temperatures, with a variety of moderators and with a variety of heat-transfer media.

Fast neutrons make for a smaller reactor, and therefore less numerical loss of neutrons. But a fast neutron reactor is not controlled easily, because the neutron absorbers normally considered—again, cadmium is one—have a small capture cross section for high energy neutrons.

Slow neutrons make for easy control of the reactor. The use of fissionable U235 or Pu239 does mean a smaller core for the reactor, but the overall size will be greater because of the introduction of the moderator.

▶ **Summing Up**—These, then, are the general aspects of nuclear reactor design as they can be currently told. Once more putting the pieces together, a typical nuclear powerplant (but not for aircraft) will be a spherical lattice of lumped uranium, possibly canned in aluminum, and distributed through a graphite moderator. An outer shield of an iron ore-concrete mix guards against radiation dangers. Through this shield penetrate cadmium control rods, recessed into the reactor core.

Inside the reactor are tubes containing molten lead which receives the heat from the reactor. The molten lead is circulated through a heat exchanger containing water as the working fluid. The heat raises the temperature of the water to boiling, and steam results.

The steam drives a standard steam turbine connected to a generator. The resultant output is electrical power.

This is the kind of an atomic power plant which might furnish electrical power to a city, replacing oil or coal-fired boiler systems. Weight and volume are not critical design criteria, radioactivity dangers are perhaps the most stringent requirement.

All this is background to understanding and assessing—and perhaps anticipating—the problems of developing a nuclear reactor for aircraft propulsion.

(Next Week: The engine—nuclear energy on a wing.)

Track Time Cut

A new production scheme at Boeing Airplane Co. has cut 75 percent from the time formerly required for fabricating cam tracks for lowering flaps on the B-47 Stratojet.

Previous method was to make these tracks from 75 ST extrusions with a hydraulically controlled duplicator which gave three units simultaneously, but required 4 hr. for the job.

In the new procedure, the raw extrusion is machined on a Farnham mill, then stretched and bent on a Hufford press. Time consumed per track is 20 min., giving 12 units in 4 hr.

America is discovering a remarkable *new kind* of flying...

Far from being just another gadget, the Lear L-2 autopilot is a device that is radically altering the fundamental nature of flying itself. Here are the impressions of prominent pilots who have tested the L-2. Here are the *facts*—as told by a few of the many owners who now fly with the L-2 autopilot day after day in their own planes . . .

"Greatest Contribution Since Airplane Was Invented"

I operate the L-2 under all conditions, and I wish to say that it is man's best friend in marginal weather. It eliminates everything undesirable in rough air flying and maintains perfect course under all conditions. The L-2 autopilot is one of the world's greatest contributions towards flying and navigation for the average private and executive pilot since the invention of the airplane. It definitely increases the safety of flying due to its all weather performance. It definitely reduces time between two points on cross-country due to a true course under all conditions. It definitely increases the smoothness of the ride in rough air due to perfect attitude at all times, arriving at your destination free from tiredness and mental strain. I would rather quit flying than do without it. (Cessna 195)

CLARENCE E. MORRIS
Nathanel City California

"Airman's Dream Come True"

In rough air the L-2 autopilot's performance is uncanny and is probably its greatest advantage next to its aid in instrument flying. A child can learn to operate it immediately. There are only two knobs to turn—one to bank right or left and another to nose up or down. That is all there is to it. The L-2 autopilot is the airmen's dream come true. (Navion)

L. D. ORMSBY
Ormsby Chevrolet Co.
San Antonio, Texas

"Now we can fly 12 hrs. a day"

Before the L-2, when we flew three or four hours on instruments, it was enough, and we would put the airplane away for the day because instrument flying is very tiring when there is no relief pilot. However, now we can fly eight, ten, or twelve hours a day, and the L-2 is our relief pilot. The L-2 actually makes a co-pilot unnecessary, and, in fact, if it weren't for take-off and landing, our airplane wouldn't even need a pilot. If we were offered double the amount of money, or even triple, we would not sell our L-2. In fact, we think so much of it that we are now having an L-2 installed in our Grumman Widgeon. (Bonanza)

CARL H. WAISER
Everbrite Electric Signs Inc.
Milwaukee, Wisconsin

"A Safety 'Must'"

No private pilot need ever worry about weather if he has the Lear L-2 autopilot aboard. If he can read his compass, if he has sufficient strength to operate the turning knob, no sudden unexpected instrument condition can ever get him into trouble. The old rule about a 180 degree turn really means something now. In my book your autopilot is a safety "must." It will get you out of danger no matter how suddenly you run into instrument weather. It gives you time to think and to study your maps and check for a radio fix. It takes all the labor and worry out of flying. (Bonanza)

K. F. CLARDY
Lansing, Michigan

"Perfect Instrument Approach"

My wife, who is normally allergic to gadgets in aircraft, put her immediate stamp of approval on the Lear L-2 autopilot after the demonstration of its use in a GCA approach. She was amazed at what a perfect instrument approach could be made in an emergency with the L-2 by a non-instrument pilot. However, what I appreciate most about the L-2 autopilot is the fact that with it the pleasure of flying will still be mine when I would otherwise be quitting because of old age—say in about twenty years from now. But with the Lear autopilot in my plane I am sure that I will continue to fly as long as I am physically able to drive a car. (Bonanza)

DR. JOHN P. LOHDAN, M.D.
Beverly Hills California

"Takes Out All the Work and Leaves Only the Fun"

The L-2 takes all the work out of flying and leaves only the fun. By holding an exact heading indefinitely it encourages precise dead-reckoning and adds greatly to the pleasure of navigation. It permits in-flight study of maps, airports and radio facility data and frees the human pilot for calculating his flight plans and using his radio. Because it removes the strain from cross-country trips, I would judge that it doubles the efficiency of the owner, his airplane and his other equipment. I consider it the greatest single contribution to private flying in recent years. (Bonanza)

CARLETON PUTNAM
Chairman of the Board
Chicago & Southern Air Lines

"Wonderful Performance"

The L-2 pilot gives a wonderful performance for such a small and simple unit. The freedom it gives the pilot during instrument flights is very important when operating without a co-pilot. We feel that we have made a good investment in safety and convenience. (Twin Beech)

HARRY F. WHITE
Union Carbide Corp.
Olean, New York

"I No Longer Hesitate to Fly Anywhere . . ."

The Lear L-2 Pilot can hold a course accurately, indefinitely, such as no pilot can do even if he has a co-pilot to do all the navigating for him! It leaves both hands free to twist dials, throw switches, futz with the carburetor heat, work the radio, study the charts, figure out ETA's with the confusers, etc. As long as my ceilings enroute and at the point of destination are such as to give me time to hunt a landing field in case of an emergency, I no longer hesitate to fly anywhere in my Lear equipped Navion through fronts, crud, crap and what have-you except ice and thunderstorms, of course. I do most sincerely believe that the Lear L-2 Pilot, the Lear Omni Range Receiver, and the Lear ADF are the three greatest contributions to private flying since the Navion itself!

ARTHUR GODFREY, CBS

"Eerie Super-Coordination"

The Lear L-2 autopilot is simply out of this world in what it does for a private type airplane. It will not only fly the airplane, but it will give your favorite airplane stability and riding qualities that you've never dreamed of because you've never seen one flown well enough to produce this almost eerie product of super-coordination. It not only gives a more comfortable ride, but it takes the fatigue out of piloting and you arrive as fresh as your passenger. And it, enroute, you really need to deliver your very best judgment on a weather or navigational problem, it gives you an opportunity to think, for it puts into the airplane a priceless quality: a desire to fly straight.

LEIGHTON COLLINS
Editor, AIR FACTS Magazine

"Definitely Superior to the Drive-In Theatre"

The L-2 autopilot is the greatest invention since one armed driving was introduced. With television added to the omni, it is definitely superior to the drive-in theatre. (Cessna 195)

ELLIOT W. SPRINGS
President, Springs Cotton Mills
Lancaster, South Carolina

"Better Than an Airline Captain"

The L-2 pilot does a better-than human job of flying in turbulent air. It is in rough air that the full enjoyment of the Lear L-2 Automatic Pilot can be seen. Long trips are now as comfortable as short ones formerly were. And how that L-2 pilot smooths out the bumpy roads and detours better than an airline captain! I wouldn't be without one now. (Cessna 195)

A. W. FREDERICK
Memphis, Tennessee

"The Missing Link"

It may well be that Bill Lear (AOPA 6975) has contributed one of the most important missing links to the development of private flying. It is quite conceivable that the L-2 right now could very well boost the average utility of a plane owned by a typical AOPA member from, say, an average of 50% to something like 90%. Such an increase in utility could, by itself, put civil aviation in the position of being one of the nation's healthiest, more thriving industries.

MAX KARANT
Editorial Director
Aircraft Owners & Pilots Assn.

"Increased the Airspeed Up to 15 MPH"

Slow flight down to 65 mph can be maintained with the L-2 autopilot so long as the prop turns up about 2000 rpm. The L-2 autopilot has increased the IAS from 10 to 15 mph (depending on altitude) due to the fact that it will hold the ship on the step perfectly, which is something that I am too lazy to do for any length of time. In short, I think the pilot is great and would not be without it. (Navion)

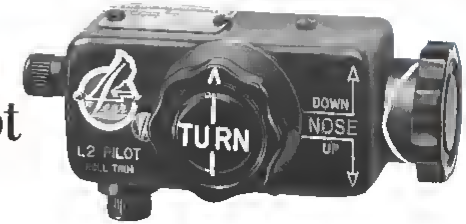
H. R. ELDRIDGE
Auburn, Texas

"Will Never Have Another Plane Without It"

It is my opinion that the L-2 autopilot is the most outstanding contribution towards the safety and enjoyment of light plane flying ever made. When visibility is very low and most of your attention must be directed outside the plane, the L-2 is invaluable. I also can visualize the great comfort to the inexperienced pilot, who suddenly finds himself in instrument conditions. He turns on the autopilot, and without fear of losing control, can devote his whole attention to getting out of the weather and returning to where he came from or contacting his nearest radio range for help and advice while the L-2 is holding any course or any altitude he desires. Our experience with the L-2 has been so satisfactory that we will never have another plane without having it equipped with an autopilot. It's the best life insurance you can buy. (Bonanza)

GEORGE V. KEITH
Milwaukee Crane & Service Co.
Cudahy, Wisconsin

the LEAR L2 autopilot



IRON IKE, Northrop power control test rig of F-89 hydraulic mockup, 'flies' while

'COCKPIT' pilot watches controls in mirror and technicians check hinge moments

'Flying' F-89 Mockup Saves Time

Northrop Aircraft engineers have left nothing to chance on the flight control performance of the 600 plus-mph F-89 Scorpion.

They are using an authentic mockup of the plane's hydraulic systems for rigorous preflight proving of the power control installations in this newest AF all weather interceptor.

And in addition to assuring the elimination of operational "bugs," this precisely designed lab facility has cut many months and manhours from the full power control system's normal development time.

►**Everything Included**—The complete mockup—actually a giant test stand—incorporates every detail of the F-89's power control system. Mechanical control of the hydraulic actuating system, from the pilot's stick and rudder pedals to the various follow-up devices that keep tab on control movement, have been included.

Every valve, pump, regulator and instrument in the system has been used. And even tubing lengths and bends have been approximated as closely as possible to conform to the installation in the airplane.

►**Flight Conditions Introduced**—To duplicate forces on the control surfaces, Northrop engineers installed mechanical devices to simulate conditions at different speeds and altitudes. Instrumentation gives simultaneous recordings of pressures, control positions, control timing and fluid temperatures.

►**Ground "Flight"**—Before the first F-89 was finished, Northrop technicians were able to check out every control and hydraulic component and establish the reliability of the overall system.

And before the first F-89 took to the air, several hundred hours of "flight" time were racked up with the mockup, eliminating considerable ground operation with the plane.

Northrop test pilots check out on the mockup to get the feel of a full power system before they fly the F-89 initially. The facility accommodates a pilot in a cockpit arrangement with basic equipment similar to that of a plane. He operates a regular aircraft control stick to move the control surfaces in simulated flight. Artificial "feel" built into the equipment is the same as that on the F-89.

►**Those Involved**—Northrop's assistant design administrator Tom A. Feeney is credited with much of the work in creating the mockup. He and a group of company technicians, including H. H. Clark, chief of the engineering test lab and L. F. Bernbach, the latter's assistant, are responsible for many of the innovations reported for the F-89 controls.

Convair Test Lab Construction Starts

Consolidated Vultee Aircraft Corp. has begun on a $650,000 engineering test laboratory at Fort Worth. The new facility, similar to several others in the industry, is scheduled for completion in August.

An altitude chamber will be installed for simulation of flight up to altitudes of 60,000 ft. and temperatures below zero. Tests will be conducted primarily on B-36 equipment, parts and components. The laboratory will also be able to test the effects of high and low temperature extremes, sand, dust, moisture and aridity.

Construction cost of the building is placed at $206,000, remainder of the cost will be for equipment and installation. The laboratory will have 45,000 sq. ft. of working space.

How Critical Metals Problems are Licked

The partnership between the jet engine and its troublesome associates—critical metals—is being dissolved.

For the jet, it will be business as usual, but with new metal constituents so that it can perform with accustomed efficiency despite the emergency restrictions of the accelerating industrial mobilization program.

Already warned by the lessons learned from World War II, the Munitions Board not only is stockpiling imported minerals that may be in short supply, and developing domestic deposits not considered profitable for normal commercial operation, but it is going to the heart of the problem to eliminate, where possible, the need for strategic materials.

▶**Jet Picture**—Through the Air Force and the Navy it has asked defense industries to re-design their products to whittle critical metal use without sacrificing performance efficiency.

This is where the jet engine comes in, for in its normal development history it took a high share of critical metals. And these are not feasible to support the shift to high-gear mass production.

▶**P&WA Tackles Problem**—What United Aircraft Corp.'s Pratt & Whitney Aircraft division has accomplished and is now doing to lick the critical metals problem is revealed in an article just published in the company's Bee Hive magazine.

After three years of intensive research by a group of development technicians headed by chief engineer Arthur E. Smith and a materials group headed by John Mertz and Rudolf H. Thielemann, P&WA has "de-criticalized" its J-48 Turbo-Wasp to the extent that the metal makeup of these jets now being fabricated contains only material that is available in North and South America, with imports from Europe, Asia and Africa eliminated.

▶**J-48 Is Example**—P&WA says that J-48 uses less critical material per pound of thrust than any other American production engine and—more important—with no sacrifice in the jet's performance and durability.

Use of critical cobalt and tungsten, normally incorporated as alloying elements in the jet's hot-section metals, has been cut to the bone. P&WA reports that "for all practical purposes," columbium has been eliminated from the J-48 and tungsten and cobalt reduced to only a small fraction of a pound per engine.

(Sole source of columbium is reported to be Africa's Nigeria, cobalt comes from Nigeria and the Congo, and there are some deposits in Idaho, and

largest deposits of tungsten are in the Philippines, China and North Korea, with some sources in Idaho.)

It's no track to build a comparatively short lived substitute material jet. The real job is to fabricate an engine material-wise without compromising its length of service or output under the extremely rigorous conditions of operation.

▶ **How P&WA Does It**—First, the project engineers for the jet analyze the engine's hot section components using the critical materials, outlining specific operating conditions, since each part, such as combustion liner, nozzle guide vane, turbine wheel, bucket, tailpipe and afterburner, poses its peculiar problem.

Metallurgists follow up and lab check the characteristics of the various substitute metals under heat and stress conditions to see if they will meet operation requirements, discarding those that don't measure up.

Those that show promise are taken over by engineering personnel, and parts incorporating these materials are designed for fabrication. Each part again requires its own analysis with respect to processing such as casting or forging, and frequently special welding problems are involved.

If the material can't fit the manufacturing procedure for mass production it will be discarded even though it appears promising property-wise.

▶ **Pre-Checks**—Special test rigs are used to pre-check the individual experimental new material parts under conditions that simulate the severe conditions of actual operation. This approach saves expense and time by eliminating parts that prove inadequate, so avoiding the need to carry them to full-scale test.

One piece of test equipment is the shock rig burner for evaluating nozzle guide vanes under extreme and rapid temperature change. These are brought to 1600 F. in a few seconds, then brought down to under 100 F.

▶ **Engine Runs**—Experimental parts that survive the rigorous lab checks are incorporated in a full-scale engine for the usual grueling test-stand proving before they are considered worthy as substitute materials.

Other approaches are also underway to minimize the critical metals problem. P&WA engineers are studying the revision of manufacturing procedures to eliminate waste in machining of parts.

And through re-design, they are attempting to lessen the deteriorating effects of extreme heat. Two of the methods, among others now being explored, are internal cooling and heat resistant coatings.

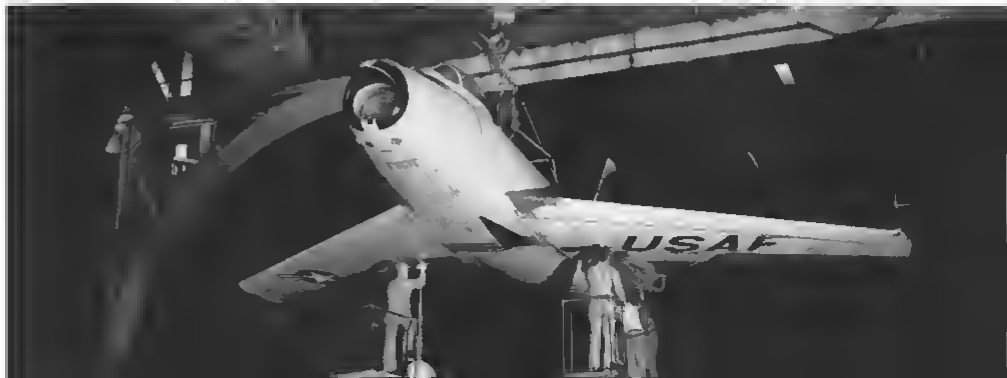
This materials-research complements engine detail design for a net result of maintaining high performance and high producibility.

LOW landing speed tests of North American's F-86 Sabre has been made recently in the 40- by 80-ft. windtunnel at NACA's Ames Aeronautical Laboratory. Tufts of wool on the wing help visualize the flow pattern.

Sabre Lands in NACA Tunnel

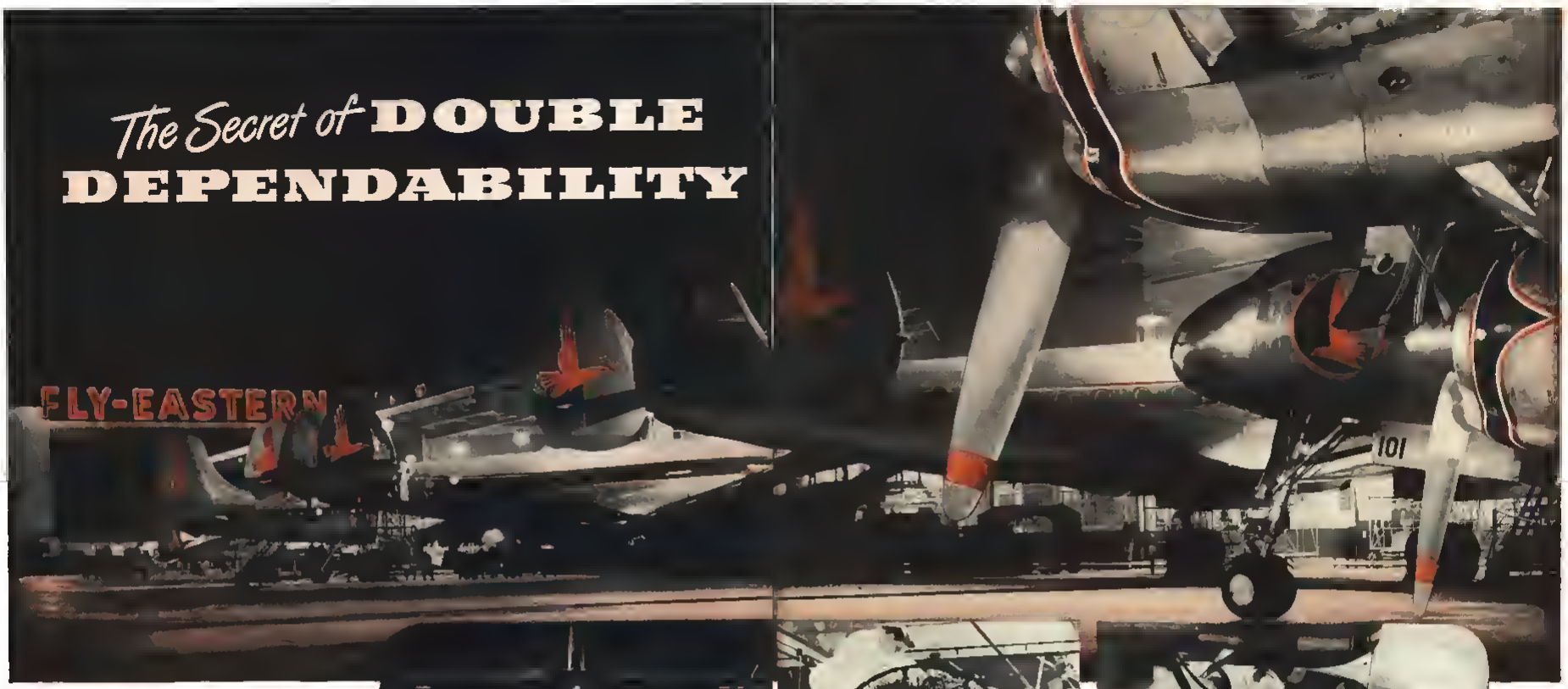
HIGH above the ground, the F-86 is being swung into position before lowering into the test section. Doors opened at top form upper boundary of test section, weigh 60 tons each.

OUTSIDE the test section, the F-86 hangs before being lowered into test position (left). Doors on sides close to form an air-tight test section seal.



INSIDE the test section, the F-86 comes to rest on the wing and tail supporting struts. Studies were conducted to determine the effects of low-speed and landing conditions on the airflow over sweptback wings.

The Secret of DOUBLE DEPENDABILITY



Everywhere in Eastern Air Lines' great maintenance base one sees concrete signs of its deep concern for safe, dependable air travel. Every operation is performed, every decision is made, with this principle in mind.

It is doubly significant, therefore, that Eastern has selected Sinclair to handle its vital lubrication needs

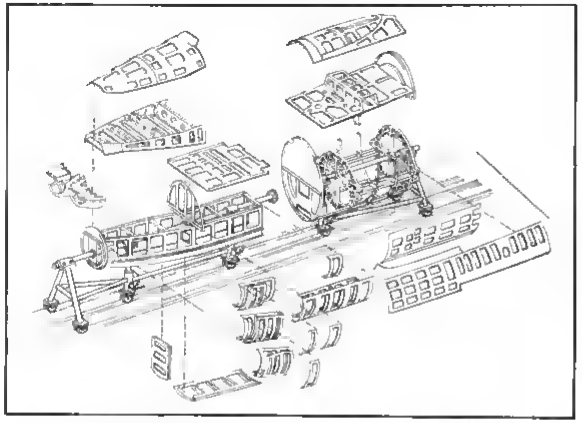
Plane Taking Its Physical. Eastern's Miami base—one of the world's largest, most complete maintenance centers. About once a week, every airliner returns here for a major examination.

They Double Check—for double dependability. On each major engine overhaul Eastern expends some 500 man-hours—many more hours than standard requirements. Many of the tests and checks made are exclusive with Eastern, too

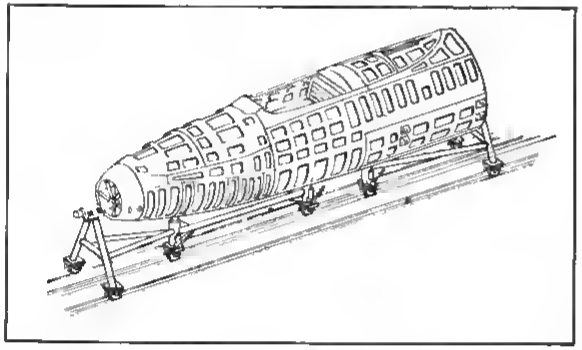
Eastern Takes No Chances with engine lubrication, either. Only Sinclair Aircraft Oil is used in the Great Silver Fleet. Sinclair lubricants reduce costs, provide fine, safe aircraft engine lubrication.

SINCLAIR AIRCRAFT OIL for double dependability

AVIATION SALES, 630 FIFTH AVENUE, NEW YORK CITY



MASTER BODY SECTIONS follow arrangement of major subassemblies in Republic's hole production scheme for F-84 Thunderjet forward fuselage section.



COMPLETE MASTER BODY is made of individual master sections pinned on frame.

Plane Fabrication's Ace in Hole

German-developed mass-production technique being studied by Republic for application to Thunderjet.

By Irving Stone

Republic Aviation Corp is probing the potential of a German-developed aircraft mass production scheme for application to modern airframe design—specifically, to its F-84 Thunderjet.

This fabrication system—known as the hole production method—was originated at Germany's Dornier Aircraft Co. Fundamentally, the idea was to bring to airframe production the ease of assembly found in the machine and automotive industries, where parts are completely finished for interchangeability so that no jigs or fixtures are required for the put together.

▶**Master Body**—Key device in this hole production approach was the master body—actually a model or master gage of a particular portion (fuselage, wing, etc.) of the aircraft structure.

As a model, it was the initial full-size example of the structure and was constructed of steel, electrically welded to avoid warpage. It incorporated all details of the particular structure—bulkheads, stringers, spars, ribs, stiffeners, and the complete rivet hole pattern.

From the master body tools were developed—templates and cutting fixtures for bulkhead and rib flanges, assembly and drill jigs for bulkheads and ribs, cutting and drill jigs for stringers and skins.

These tools served, in turn, for the fabrication of the finished parts, which were brought to the assembly line for a final put-together process that eliminated much detail work and many "tailoring" operations.

In this final assembly, the rivet holes, which had previously been drilled undersized for initial alignment, were drilled to finished dimensions for accurate match up. If dimpling were necessary, it was done immediately after final size drilling.

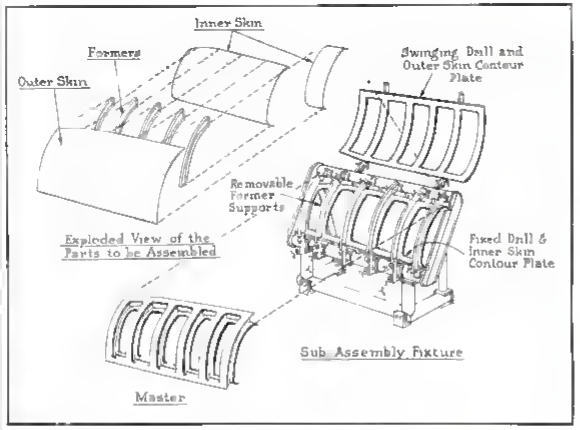
▶**System Advantages**—This hole production method, in effect a pre-coordinating scheme similar to that used in miniature toy construction sets, was suitable for the mass production of aircraft configurations then in vogue. And it afforded these advantages:

- **Unskilled labor** could be used.
- **Assembly line equipment** could be of the simplest form, with no need for large jigs and fixtures.
- **Considerable saving** of operational time, material and floor space.
- **Interchangeability** of parts was achieved.

▶**Former Application**—During World War II, the method was used with considerable success at the Henschel Aircraft Corp., Berlin. Schonefeld Japan acquired rights to the method for its aviation industry in 1943. After the war, the Henschel facilities were removed by the Russians.

A description of the hole production technique was published in 1948 by the Air Materiel Command's Industrial Planning division. This report was prepared by August Baingewald, German-trained engineer who was then employed by AMC in its Manufacturing Methods branch, and who previously had been associated with the Messerschmitt, Henschel and Heinkel organizations. He is now employed at Republic.

▶**Thunderjet Application**—Republic is now conducting a study of the hole production technique, under Air Force contract, aimed at evaluating the method for fabrication of a present-day airframe structure such as the forward fuselage section of the F-84. The study is under the overall guidance of Republic's chief tool engineer Adolph Kastelo.



REMOVABLE MASTER SECTION is used as pattern for subassembly tool.

witz, and under Bringewald's direct supervision as chief of manufacturing research and development.

Phase I of the program—an analysis of the hole production method and its adaptability to the F-84—already is completed and Republic is under way on Phase II, which is concerned with preparational procedure.

The aft portion of the F-84 fuselage offers no difficulty for fabrication under the original concept of the hole production procedure, for this part of the Thunderjet's makeup is straightforward and conforms generally to the type of structure contemplated by this mass production method.

▶**Master Body Varied**—But the forward fuselage section of the F-84 is not so readily adaptable to the method. A modified approach is required because of the integration of internal components, such as intake ducts, with inner and outer skins.

Thus, while the normal application of the hole production procedure allows the master body to be constructed as a complete unit—such as an entire fuselage or wing panel—the makeup of the F-84 forward fuselage will require the construction of a number of master body sections corresponding to the structure's major subassemblies. These sections, assembled on a rigid frame, would be pinned in position so that in their integrated relationship they would constitute a single master body.

Each removable section would serve as an individual master for the creation of the production tool to build that particular major subassembly.

The optical positioner, developed by Kastelowitz and his associates in Republic's optical tooling program conducted under Air Force contract (AVIATION WEEK Dec. 11, 1950), could be used to coordinate the assembly of this master body and its subassemblies.

One of the main advantages of the hole production method as applied to a structure such as the F-84 is the precise tolerance afforded by the master body and its composite parts. With the assembly of these major components into the master body, assembly tool coordination is automatically checked, whereas in the present system, tool coordination is not proved until the first plane is built.

▶**Aids Subcontracting**—The breakdown of the master body into major components would lend itself to the subcontracting of these sections—possibly with attaching holes drilled full size and dimpled, so that the prime contractor could install the parts without the necessity of a final drilling (and dimpling) operation.

This would be a radical—and time saving—departure from the basic hole production technique, wherein the attaching holes are pre-drilled undersized, then redrilled on final assembly for accurate matching.

However, this Republic plan for one shot drilling and dimpling represents an ideal approach that may not be able to be met in actual production.

▶**Methods Study**—Under Phase II of the project, Republic is conducting a methods engineering study of the F-84 forward fuselage section to determine breakdown requirements necessary for applying the hole production procedure.

The approach is a reverse one for operation sheets and tools. First, operation sheets are written outlining the final assembly of the fuselage section.

sketches of tools are prepared and then tools are designed.

Operation sheets are then prepared for subassemblies, with sketches to show how these fit into the final assembly layout.

Detail part operation sheets are written in the final phase of the manufacturing methods study.

Attaching holes are coordinated by specifying those which are to be drilled in detail parts, in subassembly, or final assembly. Holes drilled in the latter two assembly phases will be limited to those which must be so scheduled.

▶ **Cost Checks**—To evaluate economic aspects of the hole production scheme, time study data will be collected to establish costs for comparison with those of the present fabrication procedure.

Included in the data will be information on:

- **Time required** for tool up and production of a new aircraft design.
- **Production cost** for F-84 forward fuselage sections in quantities of 10, 15, 100 and 200.
- **Flow time** required to achieve these quantities.
- **How model changes** affect the production scheme.

Ryan's New Lathe

Ryan Aeronautical Co.'s output potential for such items as 48-in. aluminum alloy external fuel tank rings, steel cones, aft frames and other jet engine parts will be stepped up 25 percent with a new vertical turret lathe.

This unit is a 32-ton, 13-ft.-high Bullard Cut Master, with a bed 24 in. higher than the standard vertical Bullard.

The higher bed places the 64-in.-diameter turning table in an advantageous position for special milling on unusually tall parts. Ryan says that sections ranging from ¼ in. to just under 7 ft. high can be turned with ease.

One man can operate the machine safely and efficiently, using the pendant gear control arm to activate solenoids for hydraulically actuated gear changes for rotating speeds up to 160 rpm. on the table or chuck.

Hawker Siddeley To Buy Tools Here

Britain is again calling on the U. S. to furnish the tools to do the job.

Sir Frank Spriggs, managing director of the huge Hawker Siddeley Group, comprising such firms as Gloster Aircraft, Armstrong Whitworth, Armstrong Siddeley, A. V. Roe, Hawker and others, recently came here in order to shop for $8.4 million worth of machine

tools to enable the firms he represents to step up their military output. These are believed to be only immediate needs. Sir Frank stopped briefly in New York, then went to Detroit to scout the field.

Shortage of skilled British labor makes it necessary to get considerable tooling for quantity production. The Hawker Siddeley Group now employs some 55,000, and the payroll is being stepped up to 75,000 to cope with increased schedules. Avro Canada alone is doubling its employes to 12,000, and 500 skilled technicians are coming from Britain to help in production of the CF-100 all-weather fighter.

In addition to the airframe and engine plants mentioned previously, the group also includes A. W. Hawsley Ltd., currently engaged in prefabricated house construction, and High Duty Alloys, Ltd., a top British metals fabricator.

Easy Countersinking

The job of countersinking holes on Boeing Airplane Co.'s B-47 wing has been radically simplified.

Previously, fastest time for countersinking a ¼-in. hole in 75 ST sheet with the best tool available was 3½ min. And the mechanic had to expend considerable energy, forcing the tool endwise against the skin. Operator fatigue was high and workmen had to be alternated during the shift.

A new "auto-sink" unit, devised by James L. Hill and Gordon L. Spivey of Boeing's Wichita tool design group, cuts the countersinking time in the heavy gage skin to 30-40 sec., with so little effort that the operator can go the full day without relief. Greater accuracy for the some 15,000 close-tolerance holes in the wing is another dividend.

The countersink tool—a portable, self-attaching, air-motor driven device—will be manufactured and sold under license by Buckeye Tools Corp., Dayton.

Aircraft designers find a MICRO little thing

Where inches and ounces are vitally important . . . the small size and light weight of MICRO precision switches for aircraft make them "the biggest little thing in a good design."

They loom big in the plans of aircraft designers, because their precise construction, their dependable operation, their ruggedness and extreme resistance to vibration and acceleration make them ideal components of equipment that must not fail.

Many MICRO precision switches are designed to conform to rigid "AN" and "MIL" specifications. These have long contributed the utmost in performance under such exacting aircraft requirements as: screw jack limits, landing gear limits, wing fold limits, wing lock indicators, flap limits, throttle warnings, cockpit lighting controls, gun turret limits, fire control masking, radar and radio, door interlocks, propeller control devices, fuel metering devices, barometric pressure registering devices and many others.

Today new special switches are on the drawing boards and in experimental stages at MICRO SWITCH. That's why aircraft engineers find it saves time and expenses to "see MICRO SWITCH first." MICRO sales engineers with long experience in aircraft switching problems are located at MICRO branch offices to serve you.

Precision Switch "the biggest in a GOOD DESIGN"

For instance—MICRO's new TYPE LA Enclosed Switches . . . small, lightweight and sealed to operate efficiently under adverse conditions.

The MICRO Type 2LA1 precision switch shown at the right is designed to answer the need for a well sealed double pole double throw switch having a rotary type of actuator for use in a wide variety of aircraft applications.

The switching element consists of two AN3234-1 (MICRO catalog V3-1) single-pole double throw switches. The actuating mechanism is so arranged as to operate the two enclosed switches almost simultaneously. The switches are operated when the actuator shaft is rotated in either direction from the center position of the operating cam.

The MICRO Type LA Switch is also available with a plunger actuator (MICRO 1LA1) which is provided with a synthetic rubber seal and an ice-scraper assembly. This switch has proved successful in such exacting applications as found in aircraft landing gear installations.

MICRO has a complete line of precision snap-action switches which conform to Specifications MIL S-6743 and MIL S-6744 and many switches designed to conform to JAN-S-63.

MICRO SWITCH

FREEPORT, ILLINOIS

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

PRODUCTION BRIEFING

▶ **Boeing Airplane Co.** employment at Seattle has reached 26,163, while that at Wichita has passed the 20,000 mark. The Wichita division has issued a call for more than 400 electronics technicians and inspectors for work on the B-47 program.

▶ **Bristol Aeroplane Co. Ltd.,** has established a subsidiary, the Bristol Aeroplane Co. of Canada Ltd. with head offices at the International Aviation Building, Montreal. The Canadian subsidiary will market the Bristol 170 Freighter.

▶ **Convair's Ft. Worth division** has more than 28,000 persons working on the B-36 intercontinental bomber program. The San Diego division now has 19,000 employed. About 11 percent of Ft. Worth's workers are women.

▶ **Fairchild Engine division,** Farmingdale, N. Y., is obtaining additional tooling to permit greatly increased production of GE J 47 turbojet engine components.

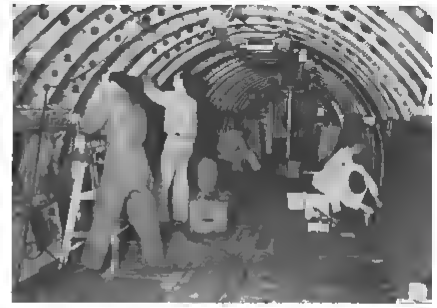
▶ **Minneapolis-Honeywell Regulator Co.** has signed an agreement with the Atomic Power division of Westinghouse Electric Corp. to perform consulting services on specially designed valves.

▶ **Missile Valve Co.** is a new development and manufacturing firm specializing in valve assemblies, such as pressure regulators, relief valves, shutoff and check valves. Headed by Roland Saye, formerly connected with Wm. R. Whittaker Co. and Pacific Airmotive, the company is located at 3945 Venice Blvd., Los Angeles 34.

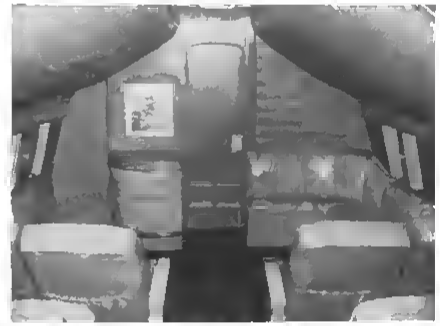
▶ **Lockheed Aircraft Corp.,** Burbank, Calif., has reinstituted hiring of women workers. At present only women with at least one year's experience at Lockheed or other assembly plants are being taken on, but untrained help will be hired by the end of the year if present schedules continue.

▶ **Sperry Gyroscope Co.,** Great Neck, N. Y., will soon swing into high gear at its new modification center on MacArthur Field, L. I., N. Y., with deliveries to start early in May. Employment is expected to reach 100 by the end of 1951.

▶ **Control Systems Co.,** 445 W. 23 St., New York, has been established to handle electronic control equipment. Control Systems now sells the standard components of Servomechanisms, Inc., Mineola, N. Y.



THE OLD Connies, before interior stripping (right) and window relocation, had standard seats and baggage racks, but



THE NEW versions have reversible seats, convertible to berths, and a small relaxing lounge, with quarter-round bar.

TWA Ocean Connies Join Luxury Parade

Carrier modification of four 749As offers 18 berths, passenger lounge and bar, redecorated interior.

Kansas City—In answer to the competition of BOAC's and Pan American's Stratocruisers, new luxury is coming to Trans World Airlines' trans-Atlantic Constellations. They will be the first Connies to offer passengers the combined comfort of full-fledged berths plus a relaxing lounge.

Four of TWA's latest Model 749As are being converted. All were to have been completed by the middle of May. Magnitude of the conversion can be gathered from these data:

- **Cost of conversion** (four aircraft)—$530,000.
- **Total man hours required**—76,000 for all planes.
- **Immobilization** of each plane—2 months.

The planes carry nine upper and nine lower berths. Uppers are restricted to single occupancy, lowers may carry two.

▶ **Connie Is a Lady**—The TWA designed and built lounge, upholstered in cafe au lait leather, boasts a quarter-round bar, complete with brass rail. The liquor drawer is ingeniously engineered so that it may be either locked in place or removed locked according to the procedures of the customs officials of the country through which the plane is passing.

Interior decor, tastefully combining ceiling, berth and window lines of light medium and dark beige, set off with dados and bulkheads of sea foam green, was done with the assistance of the R. H. Macy Co. The carpets are ⅜ in. thick.

J. F. Roche told AVIATION WEEK that the seats of the "Ambassador flight" Constellations were especially designed for TWA by Transport Equipment Co., Burbank, Calif. Every other seat will be reversible, alternate ones being convertible to berths. Roche said that TECO had done a very speedy engineering and production job and that the seats were giving the carrier excellent service. TECO seats are also used on TWA's Connie and DC-4 coach planes.

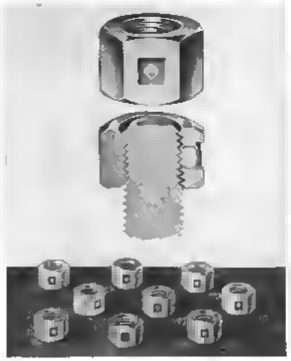
Other novelties on the Ambassador Connies:

- Large "Scotchlite" "TWA" insigne

on either side of the after fuselage These show up in brilliant colors under flood lights

▪ Two 8-ft.-wide black stripes painted chordwise on each wing at each nacelle to eliminate staining the Alclad as a result of jet exhaust stack installation

TWA feels confident that these luxurious Connies will help in the stiff trans Atlantic competition shaping up for this summer



Nylon Locknut

A 'Nylok Type E' nut, which uses an extruded nylon plug as the locking medium, is being produced by the Townsend Co., New Brighton, Pa.

Usually double chamfered, the nut can be installed from either end and is said to provide positive locking action in any position It is the reusable type and is cold forged for added strength

The nylon locking plug is inserted in one of the hex faces on the nut and projects slightly beyond the crest of the thread. As explained by the firm, when the nut is run down on the bolt, the tough, resilient nylon is compressed, but not cut, by bolt threads It grips threads tightly and sets up a counter-thrust, creating strong metal-to metal wedging of bolt and nut The insert can be used through a wide range of temperature, up to 250F., and re heating does not affect it, says the company. It also is unaffected by use in water and withstands effects of various commercial solvents, alcohols, gasoline, oil or boiling, 40 percent caustic soda, the firm points out

An advantage noted by the company is that installation torque is low when applying this nut In one case, this feature reduced by 80 percent scrap losses caused by seizing, it says Nylok locknuts are available in both American standard light (E 6) and American standard light thick (E 7) series in sizes ¼ through ⅜ in.

NEW AVIATION PRODUCTS

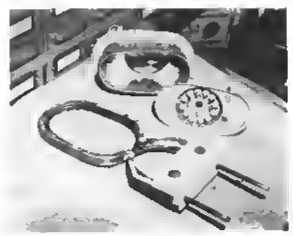
Glideslope Receiver

New glideslope receiver designed to replace World War II surplus sets are being produced by Aviation Accessories Inc.

Designated R89M (replacing R89B), the set is priced at $250 and will operate on either three or six channels through a frequency range of 332-335mc. It includes a flag alarm circuit and carries CAA type certification designation 4R4-4, the company reports.

The unit can be used with Collins 37P2, Bendix MN 92 or military AS-27A glideslope antennas. Reduction in course softening as well as channel arrangements in the set are in accordance with the latest specifications of the Radio Technical Commission for Aeronautics, explains the firm.

The receiver weighs 12 lb. 8 oz. and measures 7 11/16 x 5 3/16 x 13 15/16 in. Address: Box 4178, Ft. Worth, Tex.



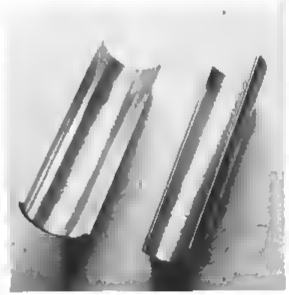
Solder Melter

A low-cost heating unit specially designed for use in aircraft maintenance repair shops to unsolder the backs of hermetically sealed instruments with safety and efficiency, has been developed by General Electric Co., Schenectady.

The rig, in several sizes, consists essentially of a Calrod heating element bent to follow the shape of instrument containers. A frame around the heater holds it to the instrument.

GE points out that until development of this device, there was no really satisfactory, low-cost, tool marketed to unsolder backs of instruments in the field or small shop. The operation is simple in the factory where electronic induction soldering equipment is available. But, says the company, the small number of repairs at each airport service station does not justify the initial cost of the electronic equipment to do this work. Further, the use of fuel fired heaters is not practical since they tend to overheat and damage instruments, adds the firm.

As a result, instruments normally have been returned to the factory for repairs, incurring an added expense. But with the new Calrod heater, this no longer will be necessary.

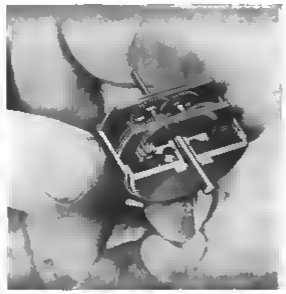


Hydraulic Tubing

Tubing especially suited for fabrication of hydraulic cylinders, shock absorbers and other applications where pressure is converted to mechanical movement, is being produced by the Tube Reducing Corp., Wallington, N.J.

An advantage cited by the maker is that surfaces of the new "cylinder finish" tubing are so smooth they need no machining for use with leather or other soft packing. Scratches, pits and other defects are ironed out when the tubing is sized by pressure exerted between two dies and mandrel. When used with metal piston rings, only light honing is required (no boring), says the company.

The tubing also is said to have better mechanical properties than hot rolled or cold-drawn standard types, because compression sizing used cold-works the metal. Tubing is available in bores from 1¼ to 6 in., depending on wall thickness.



Midget Gear Trains

Sealed, self-oiling gear trains, designed for transmission of small amounts of power, now are available from Telechron, Inc.

While these units normally are supplied with gear ratios ranging from 7200 1 to 25 1, they now may be obtained with ratios as high as 216,000 1—depending on load involved.

The gear trains are compactly designed. In addition to their sealed, self oiling features, they use hobbed—rather than stamped—gears. Machined to close tolerance, gears are built to give accurate, quiet operation and long life. Address Ashland, Mass.

ALSO ON THE MARKET

Load cells for measuring forces or weighs in tension only in aircraft stress tests have capacities of 10,000, 20,000, 50,000 and 100,000 lb. Single indicator will give separate measurements from number of cells, or load may be distributed among several and automatically totalized. Accuracy is within .25 per cent of rated capacity, says maker, Baldwin-Lima-Hamilton Corp., Philadelphia 42.

Internal thread comparator measures from pitch line of one thread in a nut to pitch line of two threads lying directly opposite it. Instrument gives plus or minus deviations from basic pitch and reads in tens of thousandths. For any one setting, device has range of ± .003 in. Made by Rimat Machine Tool Co., 1117 Air Way, Glendale 1, Calif.

Small, air-operated drill motor permits production line drilling of small holes at close quarters. It's designed to fill need for more powerful, longer life unit of this type and is particularly useful in aircraft manufacture, says maker, Cleco division of Reed Roller Bit Co., 5125 Clinton Drive, Houston, Tex.

AVIATION CALENDAR

May 27-30—Third annual Wright memorial glider meet, South Dayton Airport, Dayton, Ohio.

May 28-29—Annual membership meeting of the Aeronautical Training Society, Mayflower Hotel, Washington, D. C.

May 30—Dedication of Broome County Airport, Binghamton, N. Y.

June 2-3—Sixth Shawnee Air Fair & Industrial Exposition sponsored by Chamber of Commerce, Shawnee, Okla.

June 5-8—First convention of Air Line Stewards and Stewardesses Assoc., International, Sherry Hotel, Chicago, Ill.

June 8—Fourth annual forum of the Corporation Aircraft Owners Assn., Hotel Statler, Washington, D. C.

June 13—Semi-annual meeting of the Aviation division, Society of Mechanical Engineers, Royal York Hotel, Toronto, Ont.

June 13-16—Aviation Writers Assn. convention, Hotel Commodore.

June 15-July 1—International aviation display, Grand Palais and Le Bourget Airport, Paris.

June 18-July 6—Three-week Air Age Institute course, Parks College of Aeronautical Technology of St. Louis University, East St. Louis, Ill.

June 21-22—Second annual local air service seminar, Purdue University, Lafayette, Ind. For details write Jim Rex, 1507 M St., N.W., Washington, D. C.

June 23—1951 British National Air Races, Hatfield Aerodrome, Hertfordshire, for light, heavy craft and jets. Entry blanks available from National Aeronautic Assn., 1025 Connecticut Ave., N.Y., Washington 6. Closing date for receipt of entries is May 1.

June 27-28—1951 annual summer meeting, Institute of Aeronautical Sciences, IAS Western Headquarters Bldg., 7660 Beverly Blvd., Los Angeles.

June 27-29—Mid-year meeting of officers and directors of Aviation Distributors and Manufacturers Assn., The Homestead, Hot Springs, Va.

July 4—National soaring contest, Elmira, N. Y.

July 4-12—National soaring contest, Elmira, N. Y.

July 17-18—European ignition conference, sponsored by Lodge Plugs, Ltd., Savoy Hotel, London, England.

Aug. 15-19—Fifth annual all-women transcontinental air race, sanctioned by the Ninety-Nines, Santa Ana, Calif. to Detroit, Mich.

Aug. 22-24—Western convention of Institute of Radio Engineers and Seventh annual Pacific electronic exhibit.

Aug. 22-26—International convention of the Ninety-Nines, Mackinac Is., Mich.

Sept. 10-14—Sixth national instrument conference and exhibit sponsored by the Instrument Society of America, Sam Houston Coliseum, Houston, Tex.

Sept. 10-15—Seventh annual general meeting of the International Air Transport Assn., Westminster School, London, England. Program includes one-day visit to SBAC Farnborough show.

New Yardstick Measures Airways Needs

CAA planning group works out economic criteria for development of terminal and navigation facilities.

By F. Lee Moore

Aviomes manufacturers, airlines, airport managers, and Civil Aeronautics Administration program planners at last have a way to predict economic demand for airways, terminal equipment and airport construction.

CAA Deputy Administrator Fred B Lee and his Program Planners, D'Arcy Harvey and David Thomas have developed the new criteria for economic and equipment needs. The economic principles and equipment need indexes are set out in a pamphlet series They show what equipment is economically justified where and when They are also a comprehensive study of transportation economies. Lee's group has predicted requirements of both U. S and foreign airways and terminals (The foreign studies are security classified.)

► **How It's Done**—Here is how CAA figures airways and airport economics and equipment demand present and future

• **Immediate index of services** needed today is today's scheduled operations But forecasting depends on economics Statistics show that flights between any two points are closely correlated with the populations of the two communities and the distance between them

• **Predicting airways operations** between any two points is done by this formula Population of point A times the population of point B, divided by the distance between them The population part of the formula is modified by certain economic factors—marketing towns have more money per capita and also more business reason to travel than do industrial towns These modifying factors are also reduced to definite formula for CAA forecasting, using wholesale sales per capita as an index of the town's marketing activity, and percentage of gainfully employed in mining and manufacturing to show its degree of industrialization

► **Trends and Patterns**—Some trends the CAA program planners see as important

• **Big towns and airports** will get bigger and will get more traffic, little towns will stay little The 1950 census shows this and so do air traffic figures

• **Big money at big airports.** The concentration of population and traffic goes on The metropolitan areas need most of CAA's terminal equipment and manpower.

• **Short-haul boom.** As to airways requirements, the big and growing demand for airways equipment and manpower is for high density traffic control on the short haul heavily traveled airways between big cities

• **Air traffic pattern.** U. S. air traffic funnels from outside a big city into it and thence to another big city So the air traffic picture is like many wheel hubs, radiating spokes to the hinterlands. The hubs are connected by main axles of trunk airline travel CAA planners see this pattern as permanent They say there'll never be much regular air travel from one small town to another. The pattern is from small towns to big towns and thence to another big one

• **Helicopter impact** Copters won't change the feeder-trunk patterns They will intensify it That pattern is an economic law, not a random result of the past airline development pattern, CAA's planners say.

Non-airline air travel obeys the same laws So do rail, bus and auto travel

Even private and corporate plane ownership distribution follows the same population economics as CAA uses to predict air travel market potential

So the CAA planners are developing airways and terminal installations on the established feeder-trunk pattern, and predictions of its growth by economic law and formula

• **1955 scheduled domestic** passengers carried will be over 20 million (compared with 17 million last year) Using population-distance and other formulas, the CAA planners say they can tell where the 1955 traffic demand will be

• **Terminal equipment requirements by 1955** will be less than originally thought Program planning has shown that we'll need only 180 instrument landing systems, whereas the Radio Technical Committee on Aviation originally forecast 330 CAA likewise says we can get along on 83 airport surveillance radars and 57 precision approach radars, instead of the 150 of each originally planned

► **Equipment-buying criteria**—Here is how the CAA now decides its needs for equipment and money

• **Traffic towers.** When an airport has 7,000 or more scheduled air carrier operations (takeoffs plus landings) a year, it needs a traffic control tower.

Non-airline or military operations may change the above basic criterion So CAA uses a point score—scheduled operations count 10 points each, itinerant operations 5, and local operations 1 If an airport has more than 4,000 scheduled operations and a monthly point score of 14,000 it needs a tower

The communities served will account for over 75 percent of the nation's population It also means that 86 percent of the communities having 200 or more civil aircraft owned will have airport towers

• **ILS systems** Criteria for deciding what airports should have ILS 100 instrument approaches a month in the four highest months, or 7,000 scheduled operations a month and 20 instrument approaches a month the four highest months, or special situations like dangerous terrain.

• **Airport surveillance radar.** Here are CAA's tentative criteria for ASR installations 150 instrument approaches a month the four highest months, or, 20,000 scheduled operations a month, or critical location on the national system of civil military airways, or special areas where military and non-scheduled instrument flying is frequent

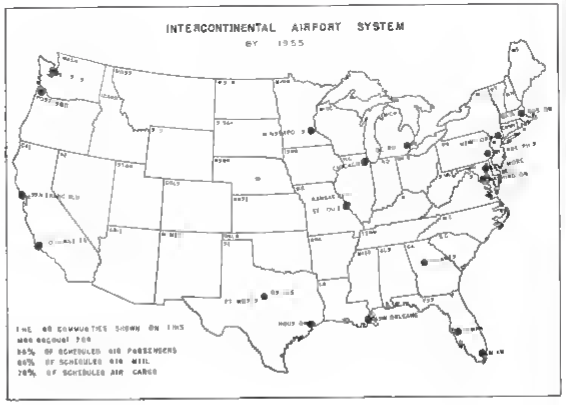
The 83 communities served by the 83 airports scheduled for ASR by 1955 account for over 62 percent of scheduled operations 84 percent of passengers, 92 percent of air mail, and 93 percent of air cargo

• **Precision approach radar.** Here are PAR installation criteria 300 instrument landings a month the four highest months, or 30,000 scheduled operations a year, or critical geographical location in the national systems requirements, or heavy instrument flying by military and non-scheduled operators

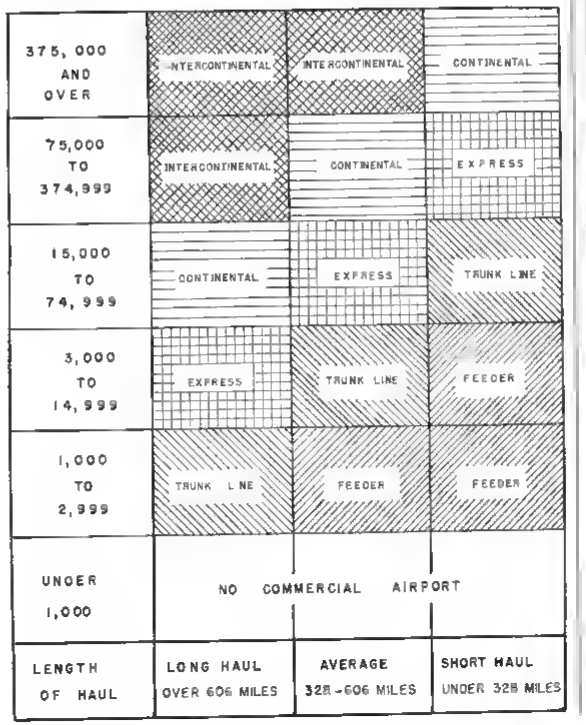
• **Terminal omniranges.** CAA will install a terminal omnirange at an airport if there is not already an airways omnirange within 12 miles and not already an ILS installation at the airport, and if the airport has 3,000 scheduled operations a year, or 25 instrument approaches a month the highest four months or special need to expedite traffic in the area

• **Federal-aid airports.** CAA figures the requirements for airport construction money mainly on the basis of the airport's traffic volume and type CAA has devised a formula to figure what kind of construction a municipal airport rates It is based on two factors—how many passengers enplane annually, and average flight length

The biggest airport is classified as



CLASSIFICATION CHART



"intercontinental." CAA sets up the following criteria for an intercontinental: 375,000 passengers enplaning per year, provided average flight length is 328 miles or more; or 75,000-375,000 passengers flying an average of 600 miles or more. Basic reason for the flight-length figure is that big planes and long flights require more terminal facilities than the small planes on shorter hauls.

A town can't get CAA-administered federal aid to build its airport bigger than the size class its traffic warrants.

Timetable for 2-0-2 Modifications

Two CAA airworthiness directives fix mandatory modification dates for the Martin 2-0-2. These comply with recommendations of the Martin 2-0-2 Modification Board. The board found no evidence of any fault that could have directly contributed to recent Northwest Airlines' 2-0-2 accidents.

CAA says all the following changes can be made by other than the stated method if they give equivalent safety. The mandatory changes and required dates of compliance:

- **June 16.** Redesign DC-input circuit breaker mounting by covering or turning 180 deg. to prevent inadvertent short circuit.
- **Aug. 16.** Cut breaker rating for propeller anti-icing circuit to 5 amp. for No. 20 wire (model 2-0-2 only). Put a negative pressure scoop on battery vent line.
- **Oct. 1.** Improve landing gear position indicating system to reduce chance of getting a "safe" indication when gear is unsafe (Martin Svc. Bul. Nos. 163A for Model 2-0-2A, and 168 for the 2-0-2 cover same subject). Provide system independent of wing heat for windshield anti-icing, de-icing, defogging, and bird-proofing (Model 2-0-2 only).
- **Oct. 16.** Add hand operated charging valve in emergency brake hydraulic system, following Martin Svc. Bul. No. 185.
- **Nov. 1.** Give more heat to critical areas of the wing for anti-icing (Model 2-0-2 only).
- **Dec. 16.** Install circuit breaker in circuit breaker panel with wire routed back to auxiliary bus control relay. Provide circuit protection to voltmeter, main bus for generator trip light circuit, and ammeter wires.
- **Jan. 1, 1952.** Redesign heater fuel control box to make leak-tight and provide adequate draining. Relocate emergency high heat switches to eliminate lag (Model 2-0-2 only). Redesign fire detection circuit to eliminate stepping relay (Model 2-0-2 only).

Other requirements:

Before reactivating the autopilot, reduce gear ratio and install field rheostat in rudder servo motor circuit to reduce stall torque. Prototype installation must be approved by a CAA regional office (Model 2-0-2 only). Martin Svc. Bul. Nos. 104A and 114 cover this.

At next major overhaul, strengthen nacelle structure (Martin Svc. Bul. No. 144 for Model 2-0-2, No. 145 for Model 2-0-2A).

Navy Calls Back EAL's Leased DC-4s

Eastern Air Lines must turn back all 17 of its Navy-leased Douglas DC-4s, reducing Eastern's fleet by about 15 percent—from 96 to 79 planes. This seriously curtails Eastern's low-fare air coach service, as almost all EAL air coach goes in DC-4s.

Eastern had already turned back its four cargo DC-4s shortly after the Korean outbreak. The first four 60-passenger DC-4s go to Navy Air Transport Service this month. The last nine go to Navy three a month starting June.

This comes at a time when Eastern's traffic demand is at an all-time high. There is no relief in sight until late this year, when the first deliveries of Martin 4-0-4s and Lockheed Super Constellations are due to start. But President E. V. Rickenbacker is dickering for possible charter deals to fill the gap.

Eastern has 60 of the 44-passenger 4-0-4s and 20 of the 88-passenger Super Connies on order.

Eastern got the Navy DC-4s from the War Assets Administration late in 1945 on a long term lease. When the Korean war occurred, Eastern was negotiating for outright purchase. To equip the planes for commercial use, Eastern had converted four as cargo-liners and rebuilt the other thirteen into passenger planes. Total cost of conversion was about $300,000 each, or a total of about $4 million, almost all of it is amortized now.

AAA Gets Important Route Extension

All-American Airways now has CAB approval of the coveted route extension from Atlantic City to Newark via Asbury Park. It improves AAA's position as a local. It gives the carrier a more circular route pattern, before AAA had stop-end wheel spokes that meant uneconomic turn-around delays and relatively poor East Coast service.

CAB set July 9 as date of the extension but AAA has petitioned for June 1, so it can get full benefit of the improved route pattern on summer schedules.

AAA plans two roundtrips daily, Washington-New York via Baltimore, Dover, Atlantic City and Asbury Park.

SHORTLINES

▶**Alaska Airlines**—Alaska reports a gross revenue of $2,487,728 the first six months of fiscal 1951, November-April. This volume is 2¼ times that of a year ago. April volume was over $500,000.

▶**Aerovias Guest**—Mexican airline starts daily service, Mexico City-Miami, on June 1.

▶**Air Transport Assn.**—An ATA working committee is researching the advantages of ticket sampling to spot traffic trends.

▶**Central Airlines**—Central is starting daily scheduled DC-3 service over its entire route system. Company has used DC-3s and Beech Bonanzas.

▶**Colonial Airlines**—Colonial carried a record 17,330 domestic passengers in April—20 percent over a year ago. Bermuda traffic of 4,474 passengers is three times that of a year ago.

▶**Continental Air Lines**—CAL reports a first-quarter net profit of $99,558 or 32 cents a share, compared with the year ago net loss of $53,249. Operating revenues are up 33 percent. Mar. 31, 1950 book value of the stock is $7.95 a share, compared with $7.09 a year ago.

▶**Flying Tiger Line**—Tiger's January-March gross revenue of $3,857,163 is four times a year ago. Net profit of $96,905 or 13 cents a share compares with last year's $17,000. Air freight, January-March, totaled 9,382,723 ton miles (not counting military charter on Korea lift)—up 61 percent from a year ago.

▶**Frontier Airlines**—Frontier revenue passenger miles totaled 5,126,715 in the first quarter, an 83-percent jump over last year.

▶**India**—Indian airline operators say TWA and Pan American get more than their fair share of outbound traffic from India to such intermediate stops as Athens, Rome, Paris. Now that India has signed an air agreement with KLM Royal Dutch Airlines, the Indians say the U. S. pact is the only one still needing revision.

▶**KLM Royal Dutch Airlines**—KLM is increasing New York-Europe all-cargo flights from one to two roundtrips a week.

▶**Mid-Continent Airlines**—MCA traffic was up 24 percent to 27,503,089 passenger miles the first quarter, from 21,802,688 a year ago. MCA is converting its DC-3s to 24-passenger seating capacity. This, plus recent purchase of four more DC-3s, will cost over $625,000. Line's DC-3 fleet now numbers 23.

▶**National Airlines**—NAL January-March net profit is $1,424,674, up 37 percent from a year ago. Net income before federal income taxes and depreciation reserve is $3,090,737, compared with only $1,399,924 a year ago. For the nine months to Mar. 31, NAL net profit after taxes is $2,079,132, compared with $156,845 a year ago. NAL's nine month net income before federal income taxes and depreciation is $4,773,018, compared with $1,200,214 a year ago. January-March passenger miles are up 71 percent over a year ago to 132,874,602. Load factor of 68 percent compares with 58 percent last year.

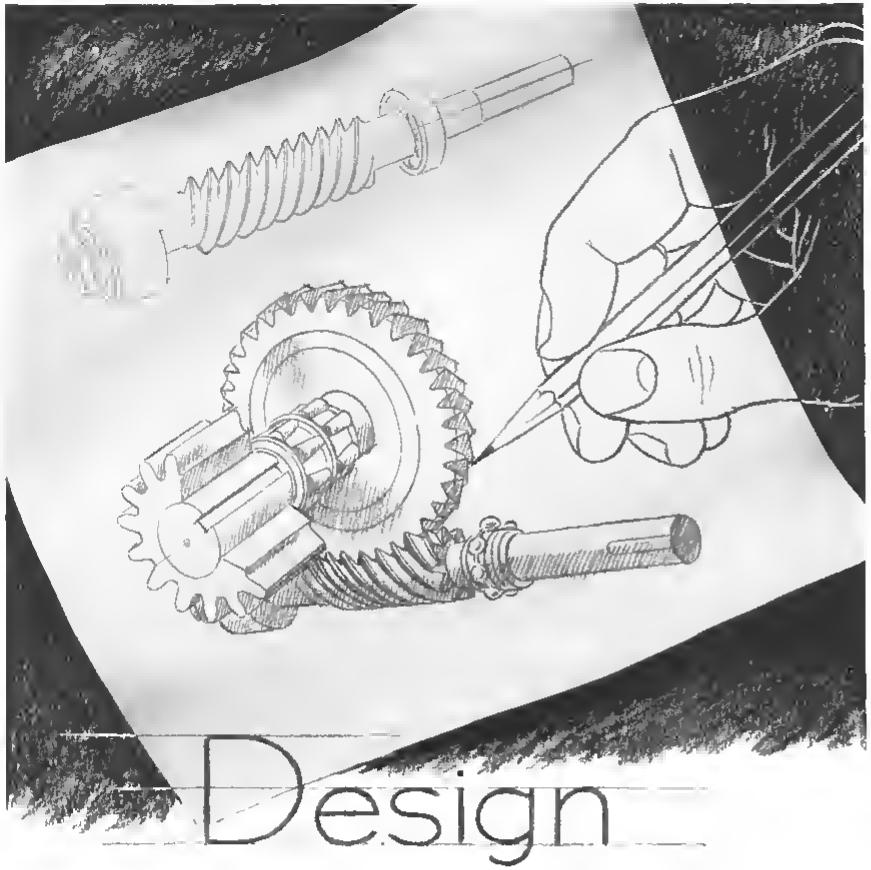
▶**Northwest Airlines**—NWA has carried 5,000,000 passengers some 3,007,734,756 passenger miles since starting passenger service in July, 1927. NWA carried 126,686 passengers January-March, 1951. Associated Press Minneapolis Editor George Masters has been named NWA's assistant director of publicity.

▶**Ozark Air Lines**—Ozark has started instrument-flight service on the St. Louis-Moline route, following similar service improvement on St. Louis-Chicago and St. Louis-Tulsa routes. Two more legs of the young Ozark system will go instrument soon: Moline-Indianapolis and St. Louis-Memphis. Ozark expects to make its inaugural flight on the St. Louis-Rockford route soon.

▶**Pan American World Airways**—PAA carried 3,784 passengers between Seattle and Alaska in April, a 26 percent gain over a year ago. Cargo totaled 512,179 pounds.

▶**Robinson Airlines**—Robinson has added another DC-3 to its fleet, bring the total to six. The new plane starts service in June, with 24 passenger seats, it is the second of Robinson's planes to carry 24 instead of 21. Robinson started out in 1945 with two single-engined Fairchild F-24s, of three-passenger capacity. Robinson seating capacity has gone up in six years from a total of six to the present 132.

▶**Sabena**—Belgian airline's 1950 traffic was up 21 percent to 195,466 passengers carried. Average load factor of 63¼ per cent compares with 62 percent in 1949, 62¾ percent in 1948 and 63 percent in 1947.



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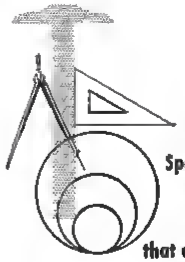

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Quantity	Part No.	Description
166	1045A	Bearing
800	3508	Flange
130	9288	Follower Assy
27953	8487	Screw
1278	10758	Belt
000	11810	Cover
100	11762	Guide
1157	35787-5	Bushing
8174	35787-10	Bushing
814	35814	Blower Assy
3967	35817	Spring
880	35855	Cap
2446	35924	Washers
4200	35832	Gasket
14	38758	Rod Assy
182	46400E	Liner
30	48346	Cylinder
1475	48360	Bearing
83	48362	Shaft
175	48363	Shaft
100	48389	Fitting
289	48390	Retainer
56	48392	Sump
532	48447	Bushing
107	48457	Adapter
390	48461	Gear
148	48468	Bearing
90	48468B	Barring
388	48469	Barring
470	48470	Bearing
75000	51506	Pins
395	54847	Clamp
71	57008	Cover
78	76236	Gear
565	81397	Tube
10736	84185	Cover Assy
261	84335	Pins
155	84381	Spacers
1351	84388	Adapter
1178	84883	Bearing
113	84487	Housing
87	84367-8	Stud
77	84561C	Rear Housing
178	84608	Bracket
39	84702	Shroud
397	84758	Bearing
14	105285	Rod Assy

ELECTRONIC COMPONENTS

Quantity	Part No.	Description
35	RA-10 DB	Receiver
80	1A188	Transmitter
150	DA-1F	Dynamotor
188	3611-8	Amplifier
35	MR-9B	Control Box
9000	45	Bulb
11000	1667	Bulb
1000	987	Bulb
300	AN3135-1	Bulb
97	FT213A	Mount
28	FT293	Mount
80	BX48-7	Dynamotor
8	RTA-1B	Transceiver

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Hub Nos — 23260 1
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MISCELLANEOUS AIRCRAFT COMPONENTS

Quantity	Part No.	Description
92	AN5531-1	Tachometer Generator G E. 8CM5A8W
1600	AN 8780-9	Wheel and flap position Indicator G E.—Individual cans
400	AN 5780-2	Weston Model 888-4 NI 11602 Description as above
1500	AW 8-65B	U S. Gauge Air Pressure Gauge (0-8000 lb.)
180	8E-492E	Pesco fuel pumps
700	TFD 8600	Thompson fuel booster pump
185	D-7818	Airtel anti-icer pumps
170	9-P771-A	Pesco fuel pump AN4102-1
250	AN4014	Eric Meter Systems D-3 hand weldable pump
300	1H2606 and KA	Pesco Hydraulic hand pump
478	D9530	Adel selector valve
833	D9530-2	Adel selector valve
488	D9550-2	Adel selector valve
744	D18844	Adel selector valve
2200	AN 4078-1	37D6810 Solenoid United Aircraft etc.
9000	AN 3096-4	Grimes Light assembly
800	AN 3096-5	Grimes Light assembly
380	AN 3096-6	Grimes Light assembly
75	EE 709-M6	Air associates Motor
115	PACA8A	Air Pioneers
80	AN 3813-1	Solenoid ignition switch
548	A-9 (94-33965)	Ignition switch
687	RS-8	Mallory Selector boxes
490	AN 6203-1	Vickers Hydraulic Accumulator
88	572-3A	Eclipse Distributor Valve
68	JH-950R	Jack & Heintz Starter Motor for JH5 starters
488	5841 (84 32253)	Electric box
18	FA129	Fisher Exterior Lights Wallace & Tiernan
1000	13018A	Intershane Box
844	D10051	Selector Valve (Adel)
135	10996A	Instrument Panel for Republic Seabee
144	K14849E	Windshield Wiper Kit (Marmette Metal Products)
48	400AJ3	Lear Actuator
181	450EC	Lear Actuator
166	488DY	Lear Actuator
195	550AJ	Lear Screw Jack
85	550CD	Lear Screw Jack

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SIDELIGHTS

(Continued from page 8)

tional Press Bldg., Washington, D. C. FTC says the magazine has no connection with the Navy, nor is owned, edited or published by Naval personnel. . . Ex-newsman Sen. Moody names Robert S. Ball, Detroit news aviation writer, as his administrative assistant. . . . A newspaper syndicate has asked Rep. John Kennedy, son of ex-Ambassador Joseph Kennedy, now law partner of former CAB Chairman James Landis for a write-up on political influence of airlines on CAB and the White House. Kennedy's reply: He doesn't know enough about it. He's doing a piece on government subsidization of the scheduled airlines, instead. . . Although Sen. William Fulbright told an editors' meeting that the situation at CAB is "very unhealthy" and predicted that an investigation of the agency would show up ethical laxity matching disclosures by his subcommittee on Reconstruction Finance Corp., so far he isn't inclined to take any definite action on a check of CAB's operations at the present time.

Civil Aviation

Task Force C of NSRB's Air Transport Mobilization Survey, headed by George Haddaway, quoted Lt. Gen. Ennis Whitehead, Commanding General of Air Defense Command: "I can assure you that only those restrictions that are absolutely essential to allow unhampered air defense operations under emergency conditions will be imposed (in case of war). The advanced planning and good progress we have made on these problems should eliminate, to a large extent, the confusion that existed when many restrictions were imposed on civilian flying at the beginning of World War II in 1941."

Transport

CAB's investigation of alleged violations of regulations by Colonial is scheduled for hearing June 4, chief subjects are non-reporting of stock ownership & free transportation. . . Industry observers expect Slick Airways to take over U. S. Airlines which has asked a federal court for an arrangement with creditors under Section 77B of the Bankruptcy Act. Slick already has filed with CAB an agreement to lease three U. S. C-46s and it has agreed to operate certain ground and maintenance services for U. S. . . Cosmopolitan magazine told the Senate Small Business Committee American Airlines ordered 2,000 reprints of the controversial article attacking the non-scheduled carriers. The article also attacked all aviation as unsafe. . . Nonscheduled air carrier people are convinced that they will be brought into a sizable military airlift program within the next few months, operating domestically between various installations and bases. . . Boost in the federal gas tax from 1.5 cents a gallon to 2 cents, as voted by House Ways & Means Committee, would cost the domestic scheduled airline $2.2 million more in operating expenses, ATA reports.

ADVERTISERS IN THIS ISSUE

AVIATION WEEK—MAY 28, 1951

SEARCHLIGHT SECTION
(Classified Advertising)

EDITORIAL

The Railroads' Toll

Buried in the voluminous files of the ICC's Bureau of Transport Economics & Statistics is the news that the steam railways of the country suffered a sizable increase in accidents in 1950 over 1949.

Among railways of Classes 1, 2, and 3, collisions alone increased about 17 percent. In 1949 they totaled 2,077. In 1950 they went up to 2,431. The 1949 collisions resulted in no passenger deaths, but 235 passengers were injured. The 1950 collisions brought 139 passenger deaths, and 952 passengers were injured.

In another important category, described as "derailments," the rails reported about 23 percent more in 1950 than in 1949. This meant an increase from 4,867 derailments in 1949 to 5,988 last year. Derailments in 1949 cost 6 passenger deaths and 211 passenger injuries. In 1950 there were 10 passenger deaths and 465 passengers injured.

There were other various types of "train accidents" including locomotive and "miscellaneous," which caused no deaths to train passengers in 1950, but injured 65 passengers. The total passenger casualty toll for "train accidents" for the year was 149 deaths and 1,432 injured, against 6 deaths and 496 passengers injured in 1949.

In addition to this toll of so-called "train accidents," there were 1,918 railroad passengers injured and 24 killed in 1950 in what ICC calls "train-service" accidents, which occur as passengers get on or off trains, trip over objects in aisles, etc. This toll compared with the 1949 train-service figures of 2,002 passenger injuries and 20 deaths.

Grand totals for railroad passenger casualties in 1950 were 173 killed and 3,350 injured, compared with 26 killed and 2,498 injured in 1949.

Figures are completed for only one month of 1951. These show that the railroads had 32 percent more collisions and 30 percent more derailments than in January of last year. But passenger injuries due to these causes were only four this January, against 39 in January, 1950.

It is worth noting for the record—since the figures are so seldom publicized—that in all types of railroad accidents in 1950, there were 358 railroad employes killed while on duty, and 21,763 were injured.

The total casualty figures for accidents involving railroads last year, including passengers, employes, trespassers and others involved in grade-crossing mishaps as well as train accidents, was 3,398 deaths and 33,255 persons injured. This could be called the railroads' toll in the United States in 1950.

The enormity of the figures is known to few Americans. We take the railroads for granted and, more or less, expect them inevitably to exact some casualties. Such is the price of progress, perhaps.

But let the public fully realize what the railroad toll is. Let them be told as fully about the railroad casualties as they are about the price of progress in aviation. Let them know how smaller still is the toll of the air. Let those who prepare statistics on aviation accidents hold their tongues and consider the rails before they generalize on aviation's casualties.

Censoring Contracts

Only our more grizzled readers with the best memories will recall most of the installments of a continued story we have been running on this page for two or three years recounting the various conflicting government policies allowing and not allowing publication of military contracts to industry.

AVIATION WEEK has clamored for fullest possible publicity for Air Force and other contracts, except for a minimum censorship we concede is necessary on some secret projects.

In February the Munitions Board clamped down on publicizing war agency contracts on the excuse of national security. It eliminated the dollar amounts on all negotiated contracts. A week after this decision was publicized, the lists came through again uncensored. Then the figures were suppressed again—on all contracts in excess of $25,000.

We said then (Apr. 2) and still maintain that the Munitions Board's "security" excuse is ridiculous. Our sister publication, Business Week, decided after some research that the administration was really unhappy about how few of the defense dollars were going to small business, and used the "security" gag to hide what was really going on.

So now comes the latest installment in this typically-Washington merry go-round, with a new Munitions Board pronouncement:

Advance information on proposed negotiated procurements of $10,000 or more will be given to major procurement offices of the Army, Navy, and Air Force under a policy approved by the Munitions Board of the Department of Defense. This move carries forward the Department of Defense policy of helping small business, J. D. Small, Munitions Board chairman said. The information in condensed form will be made available for publication in the U. S. Department of Commerce synopsis forms, and disseminated widely. This, Mr. Small pointed out, will enable more small business firms to offer their services on items needed for the armed forces.

The plan calls for publicizing every procurement, $10,000 and over, where security considerations permit. This is to be done when the closing date for the submission of bids or proposals is 18 days or more from the date of issuance. It is estimated that about 95 percent of all procurement actions are unclassified and unrestricted by security officers.

The procurement proposals will contain a condensed general description, based as much as possible upon commonly used names for the supply items, and will state the basic fabrication materials and general size. They will not necessarily include quantities or other information which might be of help to potential enemies. However, they will also include construction items such as the building or repair of structures, roads, bridges and other real property.

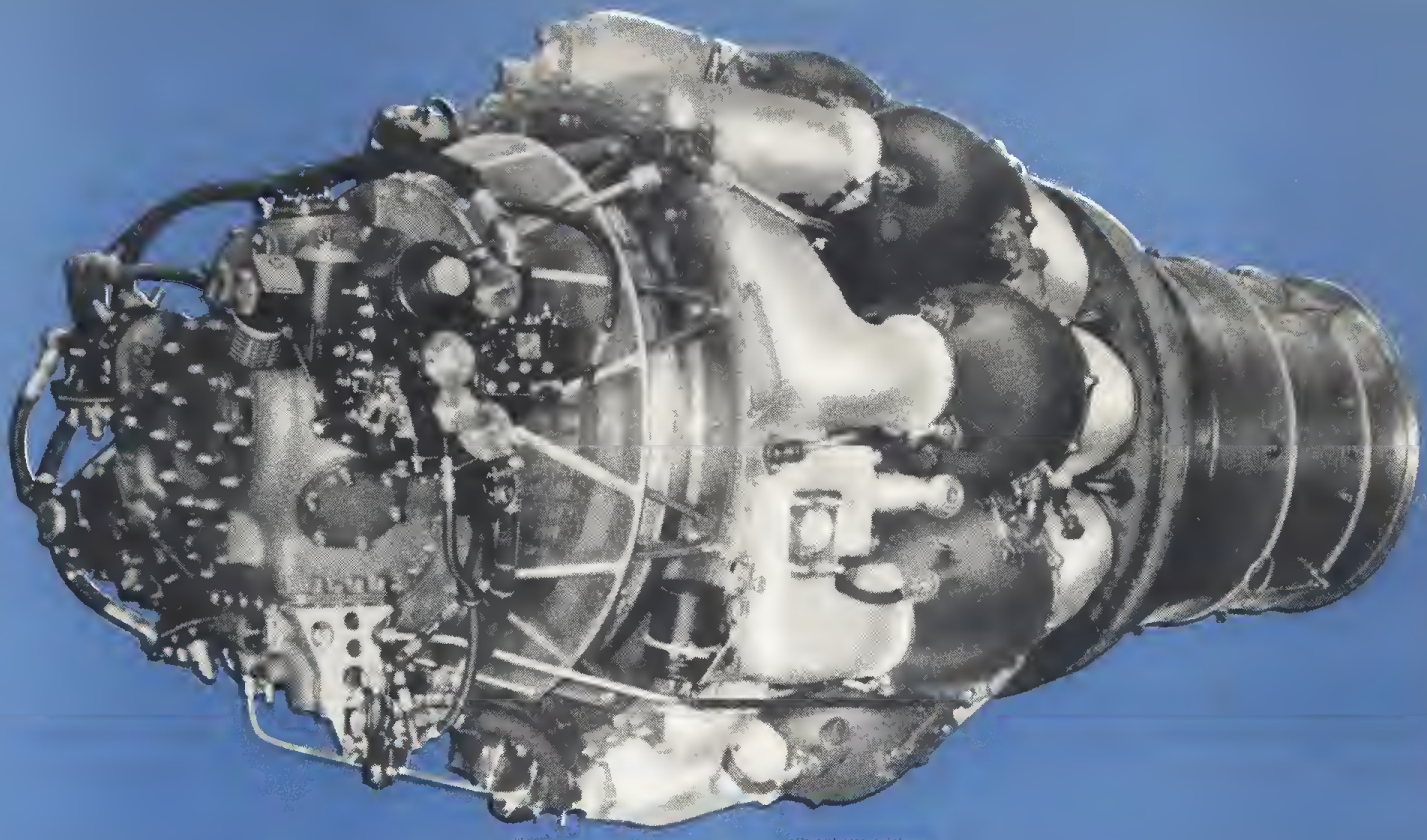
Field purchasing offices as well as main procurement offices are to transmit their proposals to the Department of Commerce for the weekly report.

The Munitions Board has advised the three military departments, and there has been included in the Armed Services Procurement Regulations the firm policy that negotiated procurements, as well as formally advertised procurements, shall be broken down into reasonably small lots to permit making multiple awards.

AVIATION WEEK welcomes this newest move to publicize government purchasing activities. We are surprised, but gratified, at the board's honest but belated confession that 95 percent of the contracts are unclassified and unrestricted by security officers. This is about what we thought when we wrote the Apr. 2 installment titled, "Now You See Them, Now You Don't." The idea that wider publicity be given contracts even before they were awarded surpasses even our expectations, although we are really skeptical on how it turns out.

If 95 percent of those contracts are unclassified and unrestricted, why can't AVIATION WEEK be sent the individual dollar values on that 95 percent of the contracts, Mr. Small?

—Robert H. Wood



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